MUNICIPAL JOURNAL AND ENGINEER

VOLUME XIX NEW YORK, SEPTEMBER, 1905 No. 3

MUNICIPAL FINANCE AND ACCOUNTING*

Essentials Dictated by Changes in Modern Conditions

MUNICIPAL finance and municipal accounting are both subjects of supreme importance and may be studied from a great number of viewpoints. At the outset I ask your attention to a brief consideration of some of the radical differences between public finance and private business, and hence the varying lines along which municipal and private accounting must proceed if each is to subserve the ends for which it is called into existence.

In this connection I remark that municipal finance, in its origin, development and objects, differs materially from private business. The object of the transactions of the ordinary business man or corporation has always been profit. In contrast, governments, state and municipal, were originally organized and at the present time are maintained primarily for the advancement of the common weal. Private individuals acquire title to real property for the income or profit that can be derived therefrom, while the realty owned by cities is generally obtained by them for the use of their citizens or to advance in other ways their common interests. As a result of the differences just mentioned, the property or works acquired by cities or individuals bear different relations to their liabilities. In private business all property owned by an individual is considered as an asset, *i. e.*, a possession available for meeting liabilities. Loans are made and credit secured on the basis of the foregoing statement. In contrast, none of the works of a city obtained by its outlays are available for meeting its liabilities as private property is available for meeting private debts. The cost or value of public works, their magnitude or significance, are not taken into consideration in the negotiations of the ordinary municipal loan. Such works are, therefore, not assets in the sense of the possessions of private individuals. The difference between public finance and private business may be further illustrated by the following facts:

In private business a man or corporation is said to be solvent only when his possessions materially exceed his liabilities. A government may, however, like that of France at the close of the war with Germany in 1871, be solvent when its liabilities are several times the value of all public works or possessions usually catalogued as governmental. France was solvent under such circumstances because it could raise a revenue sufficient to meet its accruing liabilities. It is the same with municipalities. They are solvent, not when nor because they have fixed properties that can be sold for more than their liabilities, but because they have revenues sufficient to meet their accrued and accruing liabilities. They are safely solvent, if that term may be permitted, only when the meeting of their liabilities does not require undue taxation—taxation which will cripple their commercial progress and the material welfare of their citizens.

Under the circumstances and subject to the conditions mentioned, the methods and aims of municipal accounting should differ somewhat from those of mercantile accounting, if both are to meet all the ends that can legitimately be required of them. Commercial accounts must be arranged to show the cost of conducting business, the resulting gain or loss, and the relations existing at any given time between the aggregate of the individual's possessions and his outstanding liabilities. Municipal accounts should have as their principal objects to exhibit the relative cost and efficiency of government, the relation of that cost to the present and prospective revenues of the city, and the sources and character of those revenues. In the most complete manner the books of the private business man and of the municipality should furnish the prospective creditor the information needed to determine whether his or its financial condition justifies the assumption of additional liabilities,

*Paper read before the League of American Municipalities Convention, held at Toledo, Ohio, August 23-25, by Mr. L. G. Powess, Chief Statistician, Bureau of the Census, Dept. of Commerce and Labor, Washington, D. C.

and, if so, the circumstances under which such added debt could be safely assumed. All well-managed private business houses strive to have their accounts so arranged as to meet the foregoing requirements. Permit me to call your attention to some of the changes that must be made in the accounts of the average American city before all these ends are attained.

I have placed first among the ideal requirements of municipal accounting that which will enable cities to show the relative cost and efficiency of government, the relative cost and value of all objects and ends for which the citizens make common contribution. To accomplish these ends the accounts of all cities must be so arranged as to permit of a ready classification and presentation of the aggregate payments for expenses and outlays, in a form for comparing the results obtained in any one city with those in all others. There must be adopted a unity of forms and methods which will enable such exhibits readily to be prepared and comparisons made. A few cities only, however, have accounts so arranged as to present comparable statistics in their published annual reports.

The census report relating to municipalities seeks to present for all the larger cities data for making a few of the many comparisons that are needed for ascertaining the relative cost and efficiency of government. A careful study of this report will show how limited its scope and reliability must be until some changes are made in city accounts that will bring them into as much harmony and unity as those of banks, insurance corporations and similar commercial enterprises. In these enterprises accounting, with all the endless variations required to meet individual conditions, introduces common elements into the books and reports of all establishments of the same class. The large banks in great cities, with capital of hundreds of millions of dollars, with branches and correspondents in every quarter of the globe, are able to make reports that are fully understood by all, and which, in their fundamentals, may be placed side by side with the reports of the small banks at the country crossroads. The accounts of the large and small banks are standardized, if I may use the expression. As a result, to the extent of their honesty and correctness, you can from these reports ascertain the relative efficiency of the large and small banks as money-making institutions. The same may be said of such public business enterprises as fire and life insurance corporations, loan and trust companies, and many other monied institutions.

Here we come to the real significance of the so-called movement or agitation that has become active within the last ten years for uniform municipal accounting. If you so state the principles of that movement as to make it appear that you advocate the adoption of uniform books for the city of New York and the country crossroads village, legitimate objection will spring up at once. It is impracticable. Notwithstanding that truth there is no reason why some of the essential facts relating to the revenues, expenses, outlays and outstanding liabilities of New York may not be stated in terms common with those of the village of one thousand inhabitants, just as certain facts may be presented in the same way by the banks of the great metropolis and the small country seat.

In this connection I wish to note with satisfaction the fact that great progress has been made in the last ten years toward the adoption of standard municipal reports. The movement is rapidly gaining ground and, I believe, will be taken up by all our cities within the next decade, and perfected within the next quarter century. I call your attention to the published census report now before you, as evidence of the general practicability of comparative municipal reports. I do not wish to ask you to consider the census volume as perfect, for it comes far short thereof. I probably see more imperfections in it than any of you, but I ask you to study the report mentioned as evidence of the practicability, through co-operation with cities, of a common classification of payments and receipts, with a view of ascertaining the relative cost of government and of the several governmental functions and activities. The classification employed in this report has been adopted as the result of the studies and criticisms of a great number interested in the subject of municipal accounting and municipal reports. The probable adoption of standard municipal reports in the next quarter of a century, to which I have just alluded, will follow from a thorough-going criticism of the classification of this census report and the resulting improvement.

The agitation during the past ten years for uniform municipal accounts and improved municipal accounting is correlated to a similar movement in the commercial world. In every branch of business the old "bookkeeping" has given place, or is giving place, to modern "accountings." By this change the man at the head of any given enterprise derives from his books all the information needed for its intelligent direction. The necessity for and the value of this change arise from the modern increase in the amount of business transacted by a given establishment and the growing complexity of such business. Hence it is that such an intelligent and observing man of the world as Mr. Henry Clews, in his late address to the bankers of Minnesota, lays stress upon this subject in the following words:

"But, of many improvements that might well be introduced into our commercial practice, the one of primary significance is the adoption of intelligent methods of accounting and auditing by all corporations or associations of persons which employ a considerable capital. The time has certainly arrived when the old and familiar systems of "bookkeeping" will no longer fittingly and advantageously answer for the conduct of modern financial business. It is now impossible for the manager of any large business to oversee in person its various operations and details. Results must be reduced to a scientific basis; they must be classified with the same minute care that a scientist would devote to the arrangement of a series of plants belonging to a new family or genus. This need for reform and for scientific method is not confined to any one group of institutions or any particular species of business enterprise. It is a general, if not universal, need, resulting from the great growth of our activities, both in their scope and in the amount of capital they involve. Nor is it confined to private enterprise. It extends also to municipal governments which, influenced in part by the work on accounting which is being done by the census office, are casting about for ways by which they may reorganize their business and statistical methods."

I give this extract from Mr. Clews' address to show you that this problem is not one peculiar to municipal accounts but is universal in the modern world of enormous and complex activities. Would honest city officials ascertain how to perform their duties wisely and economically and guard against dishonest practices among their subordinates, they must fall into line with the commercial world and provide accounting that gives actual and relative cost of all municipal operations and permits of comparison with the experiences of other cities. Would taxpayers and others interested in municipal well-being guard against dishonest officials they must demand the same class of accounting.

But sound municipal accounting not only calls for a classification of payments and receipts as outlined above, but it requires, as I have already stated, such accounts as will give the relation of that cost to the present and prospective revenues of the city. These accounts should readily present all facts having a bearing upon the credit of the individual city and the wisdom, under existing circumstances, of incurring liability for any given public works. The necessity for some better accounting by our cities at this point may be emphasized by the following facts:

Since 1890 the average or per capita debt of our large cities has practically doubled. The greater portion of this increase has taken place in the last six or eight years. The extension of existing public works and the establishment of new municipal industries now contemplated in these cities will, if called into existence in the near future, require an enormous addition to outstanding municipal obligations. This present and prospective increase of municipal debt had its parallel in the years between 1860 and 1875, when by extravagant expenditures, partly met with the proceeds of loans, many of our cities and other municipalities were brought to the verge of bankruptcy. The existing laws in our several states limiting the borrowing power of municipalities were enacted as the result of that period of unwise municipal borrowing. The passage of those laws relating to the power of municipal borrowing exerted a wonderful effect for good in the years which immediately followed. From 1890 to 1895 the debt of our municipalities actually decreased, and their per capita or relative debt was reduced to about one half its earlier proportions.

The pendulum, however, is now swinging in the opposite direction, and the average American municipality has reached or is approaching the limit of borrowing established twenty to thirty years ago. This movement towards enlarged municipal debts is not peculiar to American cities. It is characteristic of practically all British municipalities. Their debts are at the present time larger relatively than those of American cities. They are also increasing, and one of the results of this large and increasing municipal indebtedness in Great Britain is the recent gradual increase in the rate of interest paid by its municipalities. The most important object of new debts in the British cities is that for the establishment of municipal industries, such as water-works, gas and electric light works, tramways and other enterprises known in Great Britain as "municipal trading." The clamor for large additions to municipal debts in the United States is principally for the establishment of similar industries. The need of money for these purposes has given rise to the demand that debts incurred for such enterprises ought not to be considered in the application of existing restrictions upon the borrowing power of municipalities. Debts for water-works, street railways and kindred purposes should not, so it is asserted, be classed with those for streets, sewers, parks, schoolhouses and other non-productive or non-earning enterprises. Stated in this broad form, I can not accept the proposition. I can see the need of different rules with reference to the two classes of loans, but the present almost universal rule of treating both classes alike is preferable to the one that all cities should have unrestricted right to borrow money for so-called "productive enterprises." It seems to me that the rule should be applied to cities that conservative bankers make use of in the case of would-be individual borrowers.

When a man goes to a bank to borrow money to enlarge or extend the business of an existing enterprise or to assist in the establishment of a new one, the banker inquires how the old enterprises under this man have been and are being conducted. If conducted prudently and economically and in a manner leading to a safe margin of profit, new credit is given; otherwise not. That, I believe, is the only safe rule to adopt with reference to cities. I would apply it to them subject to the following conditions and limitations:

If a city which does not have any particular industry, such as water-works, gas works, electric light works and street cars, desires to establish one and must borrow money to start the enterprise, the same rule should be applied as in the case of a non-productive enterprise, such as a schoolhouse, courthouse, streets and sewers. The rule should rest upon the assumption that all debt contracted must ultimately be met by the taxpayers. This rule, so far as the enterprise is concerned, should continue in force until the officials in charge have demonstrated their ability to conduct the given enterprise without any present or prospective burden upon the taxpayers, and at the same time furnish the public utility concerned as cheaply as would a private corporation. When those in charge establish this fact for any given industry then, but not until then, should the debt incurred for its establishment be taken from the aggregate of municipal obligations in the determination of the borrowing power of the city. Under the operation of this rule the scope of municipal activity in the domain of municipal trading or municipal industries will be limited only by the demonstrated ability of each individual city to conduct its enterprises upon business principles and without laying burdens upon the taxpayers. Without that demonstration, debts for municipal industries should by every demand of business be treated the same as other municipal obligations. With that demonstration, they are placed in a list by themselves, subject to an altogether different rule. Such a rule, if adopted, would limit a city's power to borrow for reproductive enterprises only by its ability to conduct business upon business principles. It would put a bar upon borrowing, where such a bar should be laid against the power of cities, to engage in politically managed industries.

If the foregoing is a sound business proposition, it brings into the sphere of municipal finance the need of more perfect accounting with reference to our municipal industries

than is met with in a single American city of which I have knowledge. The finances of these industries must be treated in strict accordance with the principles of business accounting, as is done in Glasgow and other British municipalities. It is at this point that there is the greatest need for reform in American municipal accounting. The accounts of all municipal industries should be kept on a strictly business basis and should show whether they are run at a profit or a loss and also give the relative cost of public utilities furnished. Unless this is done, I believe it will be unwise to adopt any wide enlargement of the present limitations upon the borrowing power of cities through exceptions in the case of debts for the establishment or extension of municipal industries.

The question of municipal credit is closely related to that of private credit. Both should rest upon the results of honest and intelligent accounting. The perils that arise in private business from imperfect accounting with reference to the basis of personal credit are well set forth in the address of Mr. Clews, to which attention has already been called. Mr. Clews says:

"The fact that many of our business men, even those who are leaders of thought in their own communities, continue to employ antiquated methods in the conduct of their business and still depend upon out-of-date forms of statement, entails grave danger to the credit basis of the community. And this danger is the greater because those who are the cause of it have no intention to deceive. Some, when they become involved, purposely resort to misleading methods of statement, or even wilfully misrepresent the state of their affairs. But these are the exceptions. The truth is that this is more than a question of personal honesty and honor. It involves the commercial soundness of the community, and every effort should be employed to ascertain facts, and make sure that the statements submitted by applicants for credit correctly represent the state of the business to which they relate. Our practice has, in this regard, been far too lax; and a long step toward sounder conditions would be taken, were our bank managers to require the certification of the balance sheets of borrowers by competent public accountants. Such a plan is followed in European countries with most satisfactory results."

My recommendation concerning the basis of municipal credit and the relation of the same to proper accounting is, as I apprehend it, the same in principle as the one to which Mr. Clews calls the attention of the bankers in the foregoing extract.

I have mentioned the two most important relations of municipal finance and municipal accounting. There are many others that are well worth the study of all interested in the proper management of municipal finance and the welfare of those dwelling within city limits.

SAN FRANCISCO'S PORTABLE STERILIZER

THE Board of Health of San Francisco, under the direction of Dr. James W. Ward, has been active in two important lines of endeavor; one, the prevention of adulteration of food products, the other, the prevention of disease. In the latter field much good work has been accomplished, and by the use of a portable sterilizer it is hoped that much may be done to stop the spread of disease by infection from the contents of houses in which cases of contagious and infectious diseases have occurred. Health Officer Ragan has made a report on the work of the sterilizer, which has begun work within the past few weeks. It is a bulky machine, having its own locomotive power, like a traction engine. Sometimes it gets stuck in the car tracks and at others it frightens horses and creates small panics, but it is hoped that these annoyances will be overcome. In his report the Health Officer says of it:—

"At present it is in charge of one of the disinfectors of the Health Department and begins its work at 9 o'clock each morning. It is taken to the premises where a case of contagious disease has terminated. The contents of the room—bedding, pillows, pillowslips, sheeting, clothing, portieres, hangings, etc.—are placed in the sterilizing chamber and subjected to steam sterilization for a period of one hour, after which the contents of the room are replaced and surface disinfection, by the use of formalin lamps, concludes the work of disinfection.

"At present, besides the ordinary routine work of disinfection, there seems to be sufficient to keep a sterilizer busy. But after this work has been pretty thoroughly cleared it is the intention of the Health Officer to begin sterilization of the shoddy factories of the city; also the sterilization of second-hand fabric furniture.

It is the custom in many families, after the occurrence of death in the household, to dispose of the furniture to second-hand dealers, who move it away from the premises. In these cases ordinary disinfection is futile in its attempt to stamp out contagion; hence the determination of the Health Officer to prevent the introduction of disease into new homes by the purchase of these infected second-hand furniture fabrics.

"Besides the work of fumigation in the sterilizing chamber, an experiment is being conducted by the builders of the machine to introduce formaldehyde gas into the rooms from the machine while the disinfection proceeds in the retort. This will expedite matters and give the present disinfecting force an opportunity to operate in other fields besides those in which contagion is known to exist as indicated by the presence of disease.

"The public schools are to be fumigated before the opening of the new term, and the Health Officer feels that when this work is done it will go a long ways towards stamping out the origin of diphtheria."

FIRE DEPARTMENT WATER SUPPLY*

A Comprehensive Review of Requirements and Methods

At the present time, in this country at least, and in a majority of cities and towns, large and small, the most powerful and effective weapon of the fire department is the steam fire engine, with a capacity of throwing upon a fire, as a maximum, something like 600 gallons of water per minute when the fire has reached a stage which forbids effective work from the chemical engine or other auxiliary means, and when water, and plenty of water, must be had, to be used as the necessities of the emergency require. Such a piece of mechanism, mounted upon wheels for ready transportation to the point of usefulness, represents an extremely interesting combination of several distinct lines of engineering and construction. The running gear alone was a problem, and much expensive study and experience was passed through before that apparently simple portion of the apparatus had been strengthened and proportioned so as to carry safely from two to three tons of weight, at the highest attainable speed of three powerful and excited horses passing over and through any and all obstructions—a rate sufficient to wreck any ordinary running gear carrying half the load.

Then the development of the steam boiler, to give so much power with so little weight, combining quick initial steaming qualities with fairly good staying ability, representing, as it so truly does, boiler making as a high art.

Then the peculiar adaptation of the steam engine—occupying so little space—giving high proportionate power with so small an amount of material.

Then last, but prominently, comes the hydraulic end of the machine. The steam fire engine pump is one of the highest developments of hydraulic devices and a subject well worthy of the efforts of the highest ability in that line. The pump proper is not a very imposing object to look at, but its great ability consists in getting the water in and getting it out again under high speed, either under the pressure of a hydrant or up the length of a 20 ft. suction hose, and then putting this same water under a pressure of sometimes 250 lbs. and sending it through 1,000 ft. of hose. The continuous and successful performance of such work within such limited dimensions is most admirable evidence of how well conditions imposed may be met by competent and experienced designing.

Not so very many years ago a general view of our larger cities disclosed a rather uniform level of roofs, averaging perhaps six stories in height of buildings; many cities could not at that time show even so high an average of construction as indicated above. And then, too, manufacturing establishments were very much more moderate in dimensions at that time than at the present. Under such conditions, and back of the period indicated as well, the task of responding to alarms of fire and getting to work was something less than the work cut out for the up-to-date fire departments surrounded by the present conditions.

But now, when the development and introduction of passenger and freight elevators have removed restrictions from the limits of height to which modern buildings may be permitted to go; when the requisite water pressures are so great, to simply lift the water to the upper floors, to say nothing of nozzle pressure that may be required, it will be seen at a glance what a serious proposition is gradually being evolved before the firemen and fire boards of to-day.

Further than this, the manufactory now considered to be needed for the demands of business, spreading as it does, in many cases, over acres of space, coupled with fairly good height, will tend to emphasize the strong influences back of modern ideas of more water, greater pressure, prompter service, larger units of apparatus, and other important factors of the problem.

Few who have not critically examined the subject will realize the constant efforts made by firemen, boards of fire commissioners, and others intimately connected with the care and operation of a fire department to meet the constantly increasing scope of the work. Indeed, the principal actors themselves apparently forget, in their busy routine, what changes they have been through in times past before arriving at their present position and methods.

The general idea of to-day is to get at close quarters with a fire and put it out as speedily as possible; taking the hose into the burning building and fighting the enemy upon his own ground. And with this end in view it is advisable for firemen, when leisure permits, to become familiar with buildings in the districts where they operate, so that in the haste and hurry incidental to a blaze, especially at night, the utmost advantage may be taken in saving time and distance in reaching the field of action. A thorough knowledge of hallways, openings, passages, short cuts, etc., is, no doubt, invaluable in suppressing the enemy at the early stages of the fray. And this form of campaign is certainly correct in many cases, in fact whenever and wherever it can be carried out; such methods requiring the least water pressure for the work, and likely to do the least damage by the water itself. Such plans of operation make a science of fire fighting and enable a ready and resourceful officer, with a small trained body of energetic men, to extinguish a fire with the least practicable damage by either fire or water.

But this plan of procedure can not always be carried out, although there are a surprising number of fires of large extent prevented by the quick and decisive action of departments sufficiently organized to respond in a prompt and systematic manner to alarms. When, however, as unfortunately happens, a fire in a large building gains considerable head-

*Paper read before the League of American Municipalities Convention at Toledo, Ohio, August 23-25, by Mr. Charles A. Hague, Consulting Engineer, New York.

U of M

way amongst very combustible materials, and is, therefore, all ready to spring into formidable dimensions just as soon as the necessary vent and air supply are furnished, either by the forcing open of a burning building or upon sufficient draught resulting from the destructive work of the fire itself, then, in the space of a very few minutes, or even seconds, the blaze is beyond close control, and huge masses of water must be forthcoming, either to save a portion of the structure or to confine the damage to the destruction of the original premises.

Fires in five or six story buildings, with, say fifty feet of frontage, are encountered in many of the smaller cities, and, of course, require practically as heroic treatment in one place as in another, with the difference that in a small or moderate sized city the proportionate danger of a disastrous conflagration is much greater, for the reason that the fire department available and the number of steamers at command are in proportion to the population and business importance of the community, while the fighting safeguard against fire is in proportion only to the fighting force, the chances of disaster getting less towards the balancing point where the efforts of the department are sufficient to cope with the threatening danger. In many cities where, say ten steam fire engines mark the limit of the department, a fire could easily occur which would require thirty steamers to insure a reasonably quick extinction of the flames; such a fire getting beyond control would mean the conflagration which every now and then visits various communities. With a city having ten engines in its department, the serious danger of the fire spreading is not recognized, and help from adjoining communities is not called for until too late; and then the time required to assemble a sufficient fighting force is from ten to twenty times what it should have been to assemble an equal force when the fire broke out.

As an example, New York can concentrate thirty engines within an hour, and repeatedly does so at what might be called, for New York, a moderate fire, but one which would be considered a threatening one for smaller cities. It is a threatening fire for the smaller city only because the number of fire engines is limited to the population and general size of the city, and it is not a threatening fire for New York only because the enormous concentration of engines needed for quick suppression can be accomplished.

At Baltimore, according to the records, it seems that, with plenty of water in the mains, at least twelve hours elapsed from the breaking out of the great fire last year before a sufficient force was available to provide a safeguard even against the spread of the initial fire.

In a city large enough to own and employ, say, thirty engines, even should the entire department be called out, a building in the business district, with a ground area of 150,000 square feet, five or six stories in height, could be deluged with water, and a disastrous spread of the fire be prevented; while in a small city having only ten engines (and there are plenty of such cities), and having buildings of the dimensions given above, and larger, a fire getting under good headway could soon pass beyond control. In New York, with all the facilities at hand for the work of the insurance patrol, and with fire risks and water damage closely watched, it can scarcely be supposed that too much water is used at fires, and if thirty engines or so were not too many at the Express Building fire in lower Broadway last year, a similar building in a smaller city, with only ten or a dozen engines at command, and with a high wind blowing, could very easily become the beginning of a great conflagration. As to the handling the work at such fires, it must also be considered what the constant training and practice in actual fire work amounts to, by the fire departments of large cities, especially New York, Chicago, Cincinnati and other important centers.

After the necessary number of engines is assumed to be at hand in a fire department, and available for coping effectively with the five or six story fire of considerable area, the assembling of the fighting forces and getting them at work within a sufficiently short space of time is of the next, and in fact of equal importance. There are not many cities in this country able to call out for immediate service say, thirty steam fire engines; and even at that the promptness with which the several alarms can be sent in and made to assemble such a force in the face of great danger is an almost controlling factor in the problem.

A glance back over the history and record of great conflagrations in this country, including Boston, Chicago, Paterson, Baltimore and other cities, is very apt to force the conclusion that the quick response of, say, thirty engines, with plenty of water for immediate use, would very nearly, if not quite, have robbed history of much sensational material. By quick response is meant, that during a period of time not to exceed one hour, there would be, say, ten engines at work within fifteen minutes after the discovery of the fire; ten more within thirty minutes; five more within forty minutes, and the remaining five inside of the hour. These figures might possibly be improved upon by shortening the time for the different reserves, although it must be remembered that the more engines called, the farther the late ones have to run to the place of use and the longer the lines of hose have to be, as hydrants farther and farther removed from the fire are taken up by the later coming engines. But such responses as above mentioned would no doubt have lightened the load upon the insurance companies in times past where, instead, conflagration losses had to be faced.

The logic of the conflagration question seems to be that a city naturally too small to afford to maintain its fire department upon a conflagration basis must take its chances, and must also endeavor by superior discipline, watchfulness, and effectiveness to offset the lack of superior force naturally belonging to the larger cities. And in following out this idea it should always be borne in mind that there are buildings in both large and small cities of sufficient dimensions to start a conflagration, and that upon equal terms in handling the fire department the risk to the smaller cities is increased in very much greater proportion than the natural lack of apparatus.

Aside from the very great importance of the knowledge of various buildings within the reach of the department there is also necessary for the best work a knowledge of the water mains in the streets as to size and capacity. The knowledge of buildings is special and pertains to any and

each special city or case; but the knowledge of water mains and their carrying capacities under various conditions is general and applies to all cities and places. In a recent investigation made by the writer as to the capacity of water mains for supplying the fire department in a certain city, pressure gauges were applied to the hydrants in the districts in question during the busy parts of the day, and, after allowing a drop in the pressure which it was reasonable to assume might be permitted to take place, the well known laws of the flow of water through pipes pointed to the fact that a great deal more water than could possibly be taken by the engines of the entire department could be caused to flow by the difference in pressure observed and assumed. A fire which occurred soon after in the business district clearly demonstrated that the water supply was abundant, that the flow predicted would actually take place, and the information incidentally obtained by the fire department as to locating engines and the certainty of the flow through the different mains was and is extremely valuable. And from this it would seem that a map of water mains, the fire hydrants and connections, giving the flow and capacity of the various pipes and the consequent advantageous locations of fire engines, might be of value and use to the fire fighter upon frequent occasions.

Another extremely important question in meeting the threatened spread of a fire is whether there is enough water and pressure in any certain main or series of mains to enable the maximum number of fire engines likely to be needed in service in any certain neighborhood to pump to their full capacity, and this can be ascertained only by pressure tests and calculations covering the conditions involved. For example, and to state a simple case, supposing a supply main from a reservoir or a pumping station happened to be 3,000 feet in length and of 24 in. in diameter down to a point where an 18 in. main branched for another district to be supplied. Then, supposing that ten fire engines, each pumping 500 gallons per minute, could be distributed along the branch main, the first hydrant being 250 feet from the point where the 18 in. main left the 24 in. main, and the hydrants 250 feet apart along the branch main. Also suppose that 1,500 gallons per minute would be the maximum requirements for domestic service, or at the rate of 100 gallons per capita per day for 20,000 people. Then, if the branch main also had a length of 3,000 feet, the first 1,000 feet would need to be 18 in. in diameter; the second 16 in. in diameter; and the third 14 in. in diameter. These sizes and lengths would be necessary to keep the friction losses in the flowing water for the steamers and domestic demands within 13 lbs. per square inch at the end of the 14 in. section.

Again, supposing that the 24 in. main, after it passed the point where the 18 in. main branched, was needed to supply, says, 2,000 gallons per minute; then the friction loss from the reservoir or pumping station up to the point where the 18 in. main branched off would be about 9 lbs. per square inch, making a total friction loss at the end of the 14 in. section of 22 lbs. in case of a fire requiring the use of ten engines upon the branch main. If a portion of the engines were located upon the extension of the 24 in. main the details would be modified somewhat, but the general total result would be about the same.

In actual service the presence of cross-connecting mains, laid upon the "gridiron" plan, would of course modify the above stated results, and the example is confined to one main so as to make matters clearer; but test pressures taken at various hydrants, with a comparison of the various mains and their carrying capacities under the different or assumed losses in pressure, would show just what could be expected in case of a heavy call for water. Recording pressure gauges, giving records of water pressure covering reasonable periods of time, will greatly help in getting information and give a clear knowledge to the fire department as to what can be expected in the way of water supply in any given district. Many times, as the records show, very costly fires have occurred on account of the repeated failure of an adaquate supply and a lack of a clear understanding why the supply was insufficient. The Furman street fire in Brooklyn some years ago is a good example of the necessity of immediately investigating the situation the very first time a shortage is in evidence, rather than to wait for several lessons in the line of fire losses. The principal factors involved in the question are the safe and reasonable carrying capacity of these distribution mains and pipes to supply any district in question, together with the greater effective capacity of the steam fire engines likely to be used.

From proper information in the possession of a fire department covering practically the entire city, the best distribution of the engines so as to produce the best and most effective work upon a fire would be quickly apparent. After clearly grasping the idea as to the possible and practicable capacity of the water mains for use in fire service in certain districts of a city, the next step in the matter would be to find out the full capacity of the steam fire engines likely to be used, and what it would be necessary for them to do to ensure the proper fire protection of the districts under consideration. The ordinary method of calculating the delivery of a steam fire engine by the square inches of the plungers and the revolutions per minute is not altogether reliable, as, when forced up to an excessive speed the pumps can not fill solidly with water; in fact, it is possible to cause the machine to "run away" from the water and so make the motions without pumping the corresponding amount. A fairly good speed for fire engines is from 130 to 200 revolutions per minute for a good sized machine, say as follows:

Diameter of boiler,	33	inches.
Height of boiler,	62	inches.
Number of steam cylinders,	2	
Diameter of steam cylinders, each,	7¾	inches.
Number of water plungers, double acting,	2	
Diameter of water plungers, each,	4⅝	inches.
Stroke of all pistons and plungers,	9	inches.

It is sometimes stated that fire engines are run up to 500 revolutions per minute, but this is doubtless a top speed rather than one actually used and is entirely too high for proper work. The size engine given above—and it is of a make pretty well and favorably known in the larger cities at least—has an ultimate useful speed of 266 revolutions per minute, giving a theoretical delivery of 665 gallons per minute, which, with the moderate discount of 10 per cent. for slip, would call for a net delivery of, say, 600 gallons

per minute, although 500 gallons per minute to calculate upon is much safer.

But aside from the performance of the engine itself, and whatever its operation may signify, the actual delivery of water from the hose nozzle, the quality of such water, its pressure, the height to which it may be forced or the distance to which it may be thrown, and the force with which the water may be sent into a fire, are much more vital factors than any relation which the running of the engine may bear to its presumed execution. In other words, the man behind the pipe is at the point of real execution, and what he actually gets to do business with is what counts. All pumping engines, whether the very large machines used in water-works service or the very small machines which constitute a steam fire engine outfit, slip or churn water more or less in every-day operation, and this loss varies practically from one-half of one per cent. in the larger slow moving pumping engines to thirty per cent. in rapid moving pumping engines of other types; a steam fire engine under very rapid motion will reach at least ten per cent. and still deliver apparently solid water. This means an effective rate of pumping of 90 per cent. for the fire engine under heavy rapid work and of 99½ per cent. for large, slow moving pumping engines in a water-works station, the efficiency herein meaning the capacity of the pump end of the machine for actually delivering water, as against the mathematical displacement represented by the dimensions and mechanical motions of the plungers.

Of course steam economy does not figure in a fire engine, as the absurdity of reaching after steam economy for a few hours' work at the expense of greater weight and complication, and with a $500,000 fire loss threatening, is apparent without much study. What is required of a steam fire engine is to deliver a large quantity of water, without running at such a speed of revolution that a large percentage of the power is lost in opening and closing the pump valves and in by-passing the water through them. And it is also required to use its power in sending out a large quantity of water under a moderate pressure at the nozzle, say from 70 to 80 lbs. per square inch, the nozzle being of a liberal size, rather than producing a great water pressure at the pumps by using a small nozzle. It matters not how many revolutions the engine may be making, or how much water pressure may be said to exist upon the gauge at the pump, or how long or how short the lines of hose may be, the actual pressure at the nozzle governs the actual discharge of water. Under favorable conditions, two 300 ft. lines of regular 2½ in. rubber-lined fire hose, with 80 lbs. pressure at the ring nozzles, will deliver, together, 540 gallons per minute and the work will call for a water pressure at the steamer of 170 lbs. Such streams would enter a burning building at an elevation of 100 feet with energy, and a steamer of the above mentioned sizes ought to deliver such a quantity of water at a speed of 240 revolutions per minute, allowing 90 per cent. efficiency in the pumps. Two 300 ft. lines of hose, with 1¼ in. ring nozzles, would, together, deliver 600 gallons per minute and the work would call for 215 lbs. pressure at the steamer, the engine making 266 revolutions per minute. Two 500 ft. lines of hose, with 1¼ in. ring nozzles, would deliver, together, 540 gallons per minute, and the work would call for 230 lbs. pressure at the steamer, the engine making 240 revolutions per minute.

Direct water pressure at the hydrants, although under some circumstances admissible, and capable in proper hands of good work in cities of the smaller sizes, is a system to be handled very carefully. There are many cases within the knowledge of the author where, by unforeseen conditions suddenly imposed, the fire department has been hopelessly crippled at a critical moment, and so the fire has gotten far beyond control, giving conflagration a ready chance for destruction and leaving the main duty of the firemen that of wetting down the ruins after the fire had reached some sort of limiting obstruction. One of these cases was where a sprinkler system in an oil mill opened up and so bled the street mains, to which the sprinklers were directly attached, that the firemen were unable to get any streams worth mentioning from the hydrants. The fire broke out and spread so fiercely that although the sprinklers no doubt opened and began to sprinkle the building was well on fire when the department arrived; the sprinklers failed to put out the fire at its beginning, and the mill burned so that the supports of the sprinklers and pipes fell and wrecked the system, leaving numerous openings of from two to three inches diameter, and there being no shut-off for the supply in the street mains the hydrants were useless for fire service. The loss was about $50,000, a rather expensive experience.

In some cities where the direct system is used or attempted to be used a reserve is maintained, consisting of a steamer or two, but often by the time the department has realized that the steamers are necessary, the fire has become master of the situation, the delay and uncertainty in getting the unusual apparatus at work adding to the general discomfiture and misunderstanding. Where any shadow of doubt, based on actual experience, exists as to the efficiency at all times of the hydrant-and-hose service, much the safer way is to unequivocally tie up to the steamers at the first alarm, and so keep these valuable piece of apparatus up to pitch and service at all times. There have been some heavy fire losses where direct hydrant service has been too much depended upon, sometimes because the lines of hose were so long that friction in the water prevented adequate pressure at the nozzles, and sometimes because, however prompt and high the water pressure at the pumping station may have been, the restricted diameters of the mains in the streets practically destroyed the energy of the streams.

All things considered, at present at least in most cases, the steam fire engine with its 2½ in. hose provides the most general and reliable means of fire protection both in moderate sized and in the larger cities. And one of the principal virtues of the fire engine is that it is really a regenerator of power regardless of the water pressure in the mains. That is to say, even if the pressure in the mains should fall far below what would be necessary for the most feeble streams from a hydrant, hose and nozzle, the steam fire engine will take any pressure it can get, down even to the zero or beginning of the pressure gauge, and by its power regenerate the water energy to a point able to overcome the friction in long lines of hose, and maintain a nozzle pressure at the point of use capable of meeting all demands up to the bursting pressure of the hose itself.

Upon the other hand, the pressure once fixed and limited at the pumping station or reservoir, every foot which the water travels before coming out of the hose nozzle takes toll in friction, with the result that the firemen are compelled to take what is left, much or little, instead of controlling what they need for the work in hand. The flow or projection of water under a head or pressure follows the law of falling bodies, or the law of gravitation. Therefore, if an opening in a stand pipe near the ground were so situated that there was 100 feet head of water above the opening, the speed of the water coming out would theoretically be equal to the speed of a cannon ball falling through space from a height of 100 feet, that is, the speed of the water coming out of the opening would be just equal to the speed of the cannon ball the instant the ball passed the center line of the opening after falling 100 feet vertically. It has been found, however, that the actual discharge of the water, on account of contraction of the jet at the opening, the effects of atmospheric resistance and other factors, is less than the theoretical; numerous scientific experiments, practical observations, etc., when the water was being delivered into tanks or bodies of water of known capacity, have fixed the practical average and safe limits of the percentage of realized discharge at about 64 per cent. of the theoretical. And from such data there is given a means of determining the actual discharge from a hose nozzle, regardless of the operation of the fire engine or alleged pressure at a hydrant producing such delivery.

The feature of high-pressure mains for fire service, in use in some of the Lake cities, lately introduced into Philadelphia, and now talked of for use in New York, will no doubt in the future form a valuable means of concentrating a large fighting force, with plenty of water, at threatened points. The best method for using the necessary power is not yet decided and probably will not be decided for some time to come, and even then it may be found best to use different types or classes of driving machinery under the different conditions bound to arise during the development of the system. But there are many of the smaller cities with ample water supplies at hand, sufficient to represent a heavy massing of fire engines possible only in a very few of the large cities, if only the proper method for utilizing this water can be devised and made available. Take, for example, a city of 80,000 population and having in its fire department ten or twelve steam fire engines, but having at command a distributing reservoir containing from 100,000,000 to 50,000,000 gallons, or even 30,000,000 gallons of water in storage; if a high-pressure system can be built for the use of the fire department only, it would be possible to obtain the full equivalent of thirty or more fire engines upon short notice, and so completely suppress a threatened conflagration which otherwise might easily come from a fairly good sized fire in spite of the well directed efforts of ten or twelve good fire engines.

The question as to what form of power for a stationary fire station would be the best, all things considered, may still be called an open one; but, if steam could be retained at any sort of reasonable expense during times when the machinery was not in use, it would probably be the favorite, as the most reliable. Different expedients, in the shape of gas engines and electric motors, have been advocated and tried more or less; but the reliability and energy of steam directly applied, as in the fire engine only upon a much larger scale, can not be equaled by any thing brought forward so far. There appear to be three phases of the power question for a stationary pumping station for this high-pressure fire service through special mains, as follows:—

Steam power: Very reliable, but under the necessity of banking the fires through considerable periods of time, especially in the moderate sized cities; this would not be so much of an objection in the larger cities where fires are comparatively frequent.

Gas engines: Not under the necessity of keeping up fire or steam during unused periods of time, but dependent on gas supplies from ordinary city mains, and subject to certain minor uncertainties in operation. The gas engine as a means of power is well established in manufacturing and in very many situations of an industrial nature, where a derangement or stoppage would be measured by small loss. But the question has not been completely settled in its favor for the very important emergency of fire risks.

Electric motors taking electricity from street feeders: The electric method of transmitting power has been fully demonstrated for transportation and for industrial uses, and fits many such situations most admirably, but is open to the criticism applied to the gas engine, that it would most likely have to take its electricity from a street wire or feeder and obtain its supply from a far distant source of power.

To put the three modes of power upon an equal basis of reliability, as probably considered by the fire insurance companies, the proposition would look about as follows:—

Steam power: Banked fires and men on watch all of the time when not at work, with quick steaming boilers of large capacity.

Gas engines: A gas tank on the premises with gas enough in it at all times to operate the plant at least 72 hours; also a small electric generator, driven either by a gas engine or by a steam engine, for making absolutely certain the presence of an igniting spark.

Electric motors: Either a complete generating plant to be operated by gas or steam engines upon the premises, always ready for instant use and, if gas engines are used for generating, a gas tank of reliable dimensions; or a storage battery capacity of absolutely reliable character with a capacity for 72 hours, and connected to some adequate street feeder.

The fire underwriters are extremely cautious as to methods more or less unknown in the way of power and appliances for fire service, and, where electricity is employed, look very carefully into the matter. The author remembers two places in his own experience wherein the fire underwriters took very decided stands regarding the use of electrically transmitted power. In one case, in the State of New Jersey, their restrictions amounted to prohibitive measures; and in another case, in New York State, the cost of the plant was greatly increased by certain requirements to ensure reliability, one of their precautions taking the form of stipulating a double line of poles and double conductors to the power station where the pumping was done. This double-line requirement was looked upon at the time as extreme and exact-

ing, but within one year a flood and ice gorge completely wiped out of existence for several days one of the feeder lines for a length of 2,000 feet or more, and came within sixty feet or so of demolishing the only remaining line. The precaution of keeping an auxiliary steam plant constantly ready for use was also one of the stipulations looked upon as extreme, but the continuous attack of the heavy ice floe for a few hours longer would doubtless have brought the steam reserve into action.

We must all welcome, of course, any important steps in advance, but we must be assured that such steps are really an advance, and the verdict of the fire insurance companies, where the real risk is carried, is generally rather searching upon such points. It must be remembered that losses in fire are actual losses to somebody, for it puts property costing money out of existence. The protection sold by the insurance company simply shifts the losses from the few to the many, the company acting as the shifter and taking its share as it goes by. But the loss is there, and its risk is plainly indicated by the range of rates for insurance adjusted with marvelous intelligence and equity, from the extreme on highly inflammable, hazardous property approaching the impossible at one end of the line down to that on the isolated dwelling house running little or no chance of fire at the other. It would be very interesting, if it were possible to accomplish, to strike a balance showing just about what a city could afford to pay for fire protection, by canvassing the cost of insurance against the investment and operating expenses of a properly equipped fire department. It would require considerable study, of course, but in the modern tendency toward high buildings either the buildings must be made practically fireproof, or slow burning at least, or else sufficient pressure and quantity of water must be promptly at hand when fire occurs. It is often difficult for chiefs of fire departments to get sufficient funds from their boards of commissioners to effect necessary and very desirable improvements and also difficult for the board to convince their superiors in power sufficiently to place funds in their hands. Finally the question gets back to the business community, and there it goes napping. But it seems to the author that if the business men of a community could have the true relation between insurance, fire losses and cost of fire departments actually brought home to them, so that they could clearly grasp the subject through the medium of accurate figures, the way would be easy. Sometimes the business man does have the question brought home to him in the light of a fire burning his own property, and then he rubs his eyes and wonders why he did not do something about better fire protection.

With the use either of electricity or of gas engines for motive power for fire pumps, if the regular displacement pumps are used, such as are used in water-works, pumping engines or in fire boats and steam fire engines, the use of gearing must be resorted to, and this of course brings into the problem the most objectionable form of pumping apparatus on account of the high speed of the motor and the limited speed of the pump. The turbine pump has of late been rapidly coming to the front for heavy pressure work, and is eminently fitted for the use of either the gas engine or the electric motor, but it has not yet won its spurs, and unless its efficiency can be very materially increased the displacement pump, with its steam drive rigidly connected from steam pistons to water plungers, will hold its own for a long time to come.

It would also seem that with the high-pressure system for protection against fire the hydrants would need to be located nearer together than in the ordinary system where fire engines take water from the hydrants; and this for the reason that the fire engine can regenerate the pressure needed to meet any length of hose, according to the distance the engine may be away from the fire, while with a fixed pressure at a pumping station, even though the pressure may be pretty high, the quantity of water is lessened with the lengthening lines of hose. Besides this, hydrants are cheaper than hose, and the main pipe in the street carries the water nearer to the fire with very much less loss in friction than the loss in hose friction. A flow of 250 gallons per minute through 300 feet of regular 2½ in. fire hose would produce a friction loss of 67 lbs. per square inch. Five lines of hose would deliver 1,250 gallons per minute with this loss in friction of 67 lbs. between the hydrants and the nozzles, supposing all five lines to lead from the same hydrant. But to bring this quantity of water one mile, or 5,280 feet, through a 12 in. main to the hydrant would make a friction loss of only 10 lbs. per square inch. The logic seems, therefore, to be in the direction of large hydrants, with numerous outlets having independent valves, and, in a thickly built up business or manufacturing district, to have these hydrants comparatively close together so as to save hose and keep down the hose friction.

Where a high-pressure system for fire protection is installed, it should be made and kept entirely independent, and exclusively for fire service, the author not believing in connecting even sprinkler systems to the high-pressure system, as the breaking of a sprinkler connection in a burning building would very likely bleed the pipe system so as to rob the high-pressure outfit of its very reason for existence; the author has seen this happen in the ordinary system and it is perfectly possible with any system. One of the chief values of the new high pressure idea is its exclusiveness from use in any other field; it is well known how many shortcomings have been observed in the combined domestic and fire system, wherein the regular water-works supply pipes were used for fire service by simply raising the pressure. In fact the simple difference between the exclusive use of a set of pipes for fire service, and the combined domestic and fire uses, might very easily mean the difference between success or failure for the system of throwing fire streams directly from hydrants without steamers.

A very great improvement can be made to-day in many cities by a re-arrangement of water mains, so that the fire department can get a liberal supply of water, even with the present fire engines and hose. There are many cases in which too many engines have been endeavoring to take water from mains of capacities far below the draught put upon them, and where a less number of streams of more active quality would have done better work upon the fire. Four engines with energetic streams under good working pressure will throw just as much water on a fire as eight engines with weak streams and low pressure; and the active

streams are immeasurably more valuable for fire fighting. The reason is not far to seek, and it is this: The discharge of water through an orifice or opening is governed by the law of falling bodies, as already pointed out, and the velocity or speed increases very rapidly with the increase in the distance through which the body falls, or, in the case of water, with the head or pressure. Therefore it follows that under a higher pressure the discharge increases so that the lesser number of openings will throw the given quantity of water and at a greater velocity. The reverse of this proposition is, that with more openings less pressure is required to send out the given quantity of water, and the matter adjusts itself in the matter of streams of water automatically and to the utmost nicety, to correspond to the pressure. It does very little good to simply spill water into a building upon the floors, the floors being the last places to catch fire; but a searching, dashing stream, capable of delivering more water at any one spot in a certain time than its weaker neighbor, will hunt out the corners and ceilings and give a good account of itself. A system of water mains capable of supplying the fire engines can be systematically planned by considering the dimensions and character of the buildings in the different parts of the city and the possible demands for water in case of fire, even going so far as to determine the probable number and size of streams, considering as well the demands for manufacturing in the different neighborhoods. Then, the city having been divided into districts in this manner, the dimensions of the various mains for carrying what is needed may be determined by the well-known laws of friction in the water.

The dimensions of the water mains should be determined by the number and sizes of the streams wanted at the most extreme points, and must provide for the maximum flow of water with the minimum loss of pressure, and at the greatest distance. Certain diameters of nozzles under certain pressures will throw a corresponding quantity of water, and the pipes necessary to carry this quantity of water to the point of operation will be governed by the pressure thought best to be sacrificed in friction in the water going through the pipes, leaving the necessary net pressure at the hydrants for doing the useful work. In laying out such a system care should be taken that there are no dead ends, free circulation being a prime necessity. The idea is to have, as far as possible, all parts of the system aid in carrying the supplies of water to any point of greatest draught, so as to avoid restrictions at any point in the system; it should not be difficult to determine where the most important work may be needed in the city, and in fact the city should be divided into the districts already mentioned, showing the character and surroundings of the property to be protected, so that service, streams, and other particulars necessary to be considered by the fire department could be properly arranged fo. Then, of course, the mains leading directly from the water works pumps or the reservoir would have to carry all the water a part of the way at a moderate rate of friction; and as the successive outlets and branches occur they must be able to carry their respective percentages of the supply, the idea being kept constantly in mind as to what fire service is expected from the system at the various points at the time of designing, and also with reference to likely future growth in the various districts. Allowances for friction are the important items to be kept in mind in considering the above, so that disappointment and loss will not have to be met with. There is no need of guess work upon such important matters when the facts can be readily and correctly ascertained in advance.

MUNICIPAL TRACTION IN MANCHESTER

ATTENTION has often been directed to the working of municipal-owned tramways in English cities, and the case of Manchester has frequently been cited in this connection. Some of the principal data were recently laid before the city tramways committee, and are embodied in a report by U. S. Consul Walter C. Hamm, of Hull, from which we extract the following:

In 1904, the routes open for traffic aggregated 137 miles of single track. During the year just ended extensions have been made and opened for traffic, so that the average length of single track open for traffic on March 31, 1905, was 146 miles. The revenue account shows that the total income for the year was $3,159,778 and that the charges were $506,388, leaving a net profit for the year of $604,750, against $608,527 for the preceding year.

During the year the number of passengers carried was 126,900,876, an increase of over 6,000,000 on the previous year. The car mileage shows an increase of considerably over half a million miles, the figures being 14,123,124 last year, against 13,617,448 in 1903-4.

The percentage of passengers' fares shows that 71.94 per cent. paid 2 cents for the journey, 11.01 per cent. 3 cents, 7.10 per cent. 4 cents, and 5.40 per cent. 1 cent. Of the total number of passengers carried, 91,281,804 paid 2-cent fares.

The electrical energy used during the year amounted to 18,854,240 units, against 16,815,764 in the previous year. The average traffic revenue per car mile was 21.36 cents, against 21.04 cents, and the average traffic revenue per mile of single track $21,495, against $22,340 in 1903-4. The average working expenses per car mile, including power cost, was 13.98 cents, against 13.56 cents.

There has been a reduction in working hours from seventy to fifty-four hours per week. The maximum wages paid motormen is 14 cents per hour and conductors 13.50 cents per hour. A grant of one week's holiday per year with pay is given. Uniform clothing is supplied and free riding on the cars to and from duty. In Hull, which is the only instance in England of motormen receiving more than 14 cents, the pay is 15.4, but there is no holiday allowance.

MUNICIPAL ELECTRIC LIGHTING*

What Has Been Accomplished in This Field in St. Louis, Mo.

I ASSUME that at this convention the representatives from the various municipalities of the United States are here seeking after the truth upon every subject that will tend to improve or better the material or moral conditions of our municipalities. This assumption being correct it is for me to anticipate the manner and method of treating this subject by which you think you can derive the greatest benefit.

While it is not always the rule, to my mind the first two and most essential things necessary to the health and happiness of our citizens are the water and sewage problems. Bringing clear, pure water into the city to sustain life, cleanse and purify the surroundings and, after it has thus performed its duty, getting it out of the city in the best possible and least offensive manner are things not to be neglected.

It is not my purpose to discuss these two propositions other than to state their relative importance among the many things necessary to make our cities healthy, pleasant and profitable to live in. Among these is the subject matter immediately before us. In the creation, God said, let there be light, and there was light. And to-day man says, let there be light, and there is light. Not by fire and brimstone, or the later method of the match and the coal-oil lamp, but by the simple twist of the key in the socket of a little lamp, or the throwing of a switch, he is able to transform a darkened municipality into a blaze of light and glory that is the wonder of man.

The modern electrical illumination is a powerful agency for the prevention of crime and the protection of the citizens. Some say that it is an agency for the punishment of crime. This may be true, but I am unable to determine the type of current used by Prosecuting Attorney Folk in his searchlight on municipal corruption in St. Louis, or the voltage by which he was made Governor of Missouri. In both cases, however, it must have been of a very high potential.

The best lighted city or town will have less crime than the city or town which, through false economy, reduces the number of lights to such an extent that crime and murder prevail to an unusual degree. One thing is certain. If you decrease your lighting you will be compelled to increase your police power, and if you have a well lighted city your police power can be reduced. And who would not prefer a well-lighted city or town to a poorly lighted city, even though it were well policed?

Passing by the old methods of illumination, such as the lard oil lamp, he tallow dip, the coal-oil and the gasoline lamp, we find ourselves facing gas and electricity as the modern methods of illumination. The method of burning gas has improved wonderfully of late years and has resulted in greater candle power from less gas than formerly, and is one of the necessities of modern life.

Electricity has reached that stage of development and pertection that no sane man will question either its practical application in modern life or its commercial success. There is no form of life or energy that is so flexible, or that can be carried such distances with greater efficiency, and the city, town or village, the factory, hotel, public building, or other place requiring light or power that remains without this useful agent is certainly not keeping abreast of the times.

The city of St. Louis was one of the first cities to adopt electricity for the lighting of her streets and alleys. The streets were lighted with 2,000-cp arc lamps swinging over the cross streets from 60, 70 and 80-foot poles. The alleys were lighted with 32-cp incandescent lamps. This contract took effect in 1890 and was for a period of ten years, and the cost per arc lamp per year was $74.95. As stated above, the streets of the entire city were lighted with arc lamps. This system was a failure in the residential portion of the city, due largely to the height of the lamps from the streets, the lamps casting their rays over too small a portion of the territory to be illuminated.

In 1899 the city let a new lighting contract, which took effect in 1900. The central or business portion of the city is now lighted by arc lamps. The distribution of the lamps is much closer and better than under the former contract. The lamps are hung from neat ornamental iron poles at a height of about 20 feet from the walk and are of the enclosed 2,000-cp type. They cost the city in round figures $98 per lamp per year. The residential and outlying districts are lighted with Welsbach gas lamps of 60-cp, and cost the city per lamp per year $28 in one section and $24.45 in the other sections.

These lighting contracts are supposed to have cost the lighting companies $47,000 to pass the city council and house of delegates. Mr. Folk landed most of the boodlers in the penitentiary, and as a reward the people of Missouri made him Governor of the State.

Every man has a right to express his opinion upon public questions, and it is my opinion that the city of St. Louis should not at this time pay more than $75.00 per electric lamp, per year, for her lighting to a private company, though she is now paying $98.00; this is especially so when the city law makers have granted the lighting companies permission to do commercial lighting, pre-empt and occupy without compensation our public highways, deny the right of competition to others, and deny the right of property owners to cross an alley or street overhead or underground that he

*Paper read before the League of American Municipalities Convention, held at Toledo, Ohio, August 23-25, by Mr. J. W. Wood, Chief Engineer, New City Hall Municipal Light and Power Station, St. Louis, Mo.

may light a building from his own lighting plant on the opposite side of the street or alley.

In 1901 the city of St. Louis was paying the lighting companies 13 cents per kw. for current used to light its public buildings. The party elected in the spring of 1901 was pledged to municipal ownership of public utilities, the first and most inviting field being the lighting of public buildings. The first act of administration was to pass an ordinance and appropriate the money to erect two electric plants to take in groups of buildings, one to be erected at the city hall to light the new city hall, old city hall, four courts and jail, the courthouse and No. 6 engine house, this group, with the exception of the fire engine house, being confined within a single block. The other plant was to take care of the insane asylum, female hospital and poor house, these being all large buildings. This ordinance was passed in June, 1901, and the then existing contract with the lighting companies expired in September of the same year. The lighting companies immediately began to bulldoze and threaten to refuse to make any temporary contract or extend the time beyond the life of their contract, which was renewable from year to year. Owing to this action on the part of the lighting companies, and the time being too short to erect the plant, the mayor vetoed the ordinance.

In the following September, when the bids were opened for lighting the public buildings, the city was surprised at receiving from the companies a bid for 6 1-4 cents per kw. hour of current, a drop from 13 cents. For the time being this knocked the life out of the proposition to instal a plant. One year later, however, bids for the same work were raised to 7 1-2 cents, and I presume the companies would soon have had the old rate back, but the mayor and the board of public improvements, anticipating a rise in the rate as long as the city was helpless, accepted the bid of 7 1-2 cents and at once framed an ordinance to instal the plants, which was duly passed. The plants were then installed, as originally intended, at both the city hall and at the insane asylum. I shall speak more particularly of the city hall plant, because as it was larger and being within the city hall, I was able to watch it more closely and direct its management. While not a large plant in the common sense of the word, the people looked upon it as redeeming party pledges and also the entering wedge in the campaign for municipal ownership.

It was my good fortune, by direction of the board of public improvements, and especially its president, Mr. Hiram Phillips, to instal and, I believe, successfully operate this complete plant, and after two full years I have demonstrated to the people of St. Louis that as compared with what we paid to the lighting companies in 1901, 13 cents per kw. hour, we have made the same current for two years at an average of 1.56 per kw. hour, and for the past six months the cost per kw. hour has been less than one cent.

The Plant

The generating plant consists of three 185-hp, simple non-condensing engines, each with two direct-connected electric generators, one of the alternating current type and the other of the direct current type. This system of two generators producing two different currents is an unusual combination. Both generators produce current at 220 volts and the alternating generator is excited by the direct current generator. This alternating current is then transformed up to 2,200 volts and conducted through the streets for about a mile and then reduced to 110 volts for use in lighting the various buildings already noted. The current from the direct generators is used to light the city hall and run the elevators and motors in that building. The plant being divided into three units it is thus very flexible, two engines being able to carry the maximum load and one engine being able to carry the minimum load. One engine is always reserved for repairs or emergencies, and in this manner the operating expenses are reduced to the most economical point. The installation of about 100-hp in motors in the city hall necessitated installing the fourth unit last summer, a direct current 75 kw. 220 volt outfit being adopted. This unit can be used for power alone, or can assist in the lighting of the city hall.

The completed electrical plant now in operation cost the city $40,000. This does not include the boilers and feed pumps, but includes $5,000 worth of electrical conduits in the streets to carry the current to buildings at a distance from the plant. This plant is not an extravagant one in finish or detail. Nor was it purchased at a job lot sale, but if you will pardon me for expressing my personal pride, I will say that this plant is modern, complete in every detail, thoroughly practical, and operation has proved it to be economical.

Operation

There are three engineers, one receiving $150.00 per month, and two $90.00 each per month. The firemen receive $60.00 per month; dynamo tender and coal passers receive each $50.00. Coal costs $2.00 per ton. You will note from the salary list that the plant is not operated upon the penny plan. The help receive fair wages, and as a result we are able to secure good help; we have no accidents or repair bills to eat up our profits.

Our system of checking up is as complete as it is possible to make it, and to this system we owe our success. Every building has its recording wattmeter; the boilers have their water meter; every pound of coal is weighed at the building; every pound of ash is weighed; each engineer (that is to say, every eight hours) is required to read all meters and record, over his signature, the work of his watch on data sheets provided. These daily report sheets are filed with the chief engineer, and from them is compiled the monthly report showing the output and expense account.

An engineer's log book is kept in which each engineer records the number of hours each engine, generator, pump, boiler or any part of the plant is in service; the amount of oil, waste or packing that is used. Provision is made for recording any special work done, cleaning or accidents. We know the date we pack an engine or pump; how long the packing lasted. In other words, there is a complete record of the operation of the plant, no guesswork on anything. Some will probably say that this is too much book-keeping and takes too much time. Such is not the case. Our log books and data sheets are arranged and printed to suit the conditions, and ten minutes time on each watch will suffice to record all the data.

I would remind you, gentlemen, of the fact that every employee of this plant has access to these records, and as a result he is stimulated in his work. For instance, we have a recording steam gauge which records the steam pressure in the boilers every minute of the day. Firemen are not allowed to vary their steam pressure more than five pounds. The first thing each fireman does on coming on watch is to read the record of his predecessor; the result is that an even steam pressure is maintained in the boilers at all times, and you all know that this means a saving of fuel.

The most enthusiastic would not predict that this plant would pay for itself in less than three years, but the record shows that the plant has paid the original investment of $40,000 and $3,988.07 for interest and depreciation, all in twenty-three months, with a balance of $1,310.00 on hand on the first day of June, 1905.

Our system of arriving at these results is as follows:

I shall only give you the total for the twenty-three months, although the monthly figures are very interesting.

The entire total expense of operating the plant	$33,429.46
The percentage of expense charged to the plant	10,327.54
Interest and depreciation, 10 per cent. on $40,000.	3,988.07
The expense, interest and depreciation	14,360.71
Cost of current at contract price with lighting company	55,670.81
The net earnings	41,310.10
Output of plant in kw. hours	891,573

DIVISION OF EXPENSE, BASED UPON ACTUAL OPERATION

Cost of heating and ventilating	65.5 per cent.
Cost of hot water and house supply	2.0 per cent.
Cost of elevator maintenance	1.5 per cent.
Cost of electric energy	31.0 per cent.
Total	100.00

The high percentage for heating and ventilating is due to the fact that the blast or fan system is used; while the most sanitary form of heating this is the most expensive system. Prior to July, 1903, the steam plant was only used for heating and ventilating the building. In 1901-2 the total expense for operating the plant was $12,730.23. In 1902-3 the total expense was $11,022.29.

It will be seen that the average for these two years is $11,876.26. In July, 1903, the new electric light plant began operations, and from July 31, 1903, to July 31, 1904, the entire total expense of heating the building (as heretofore) and operating the electric light plant was $17,192.03.

Now if we deduct from this amount the average cost per year ($11,876.26) for heating before the light plant was installed, we have a balance of $5,315.77, which represents the total cost of operating the light plant.

These results are not arrived at by charging the plant with 13 cents, per kw., the price paid the lighting companies at the time the plant was authorized to be installed. On the contrary, we accepted the competitive rate established by the lighting companies, which at the time the plant was ready to operate was cut to 7 1-2 cents (a further cut to 5 cents being made in September, 1904), and against these prices we have paid for our plant in twenty-three months. Many of you would say that in face of these prices you should not instal a municipal plant, but even with these low rates you can see what can be accomplished.

There are only two things the lighting companies can say against our proposition, that is, that we charge nothing for our building rent, the plant being in the city hall basement, and we pay no water rent; our water rent would not exceed $10.00 per month, and the basement of our building could be used for no other purpose. I do not believe that any municipality should throw away any natural advantage it possesses or charge itself with high rents for space, when these same spaces could not in the very nature of things bring a high rent from private parties, but franchise holding companies always insist upon the city paying all of these charges in order that they themselves may make a more favorable showing.

There are important reasons why many franchise holding companies cannot charge less than they do; the promoter must have about 25 per cent. of the stock for promoting, without investing anything. Next, the bonds are sold at a discount of from 25 to 50 per cent. Then the stock must be watered for 100 per cent., with the result that the people must pay dividends upon something that thieves have stolen and bartered away.

The municipality sells its bonds at par, often receiving a premium for them. It can buy in the open market as cheap and cheaper than private consumers can. The result is that the municipality has the goods for every dollar it has invested. As for the technical knowledge required to instal or operate a municipal improvement of any kind, the city has the same opportunity of employing such help as corporations have.

POLITICAL

The stock-in-trade argument against municipal ownership has always been the existence of too much politics, too much dishonesty and corruption in political affairs. I am highly sensitive to the fact that honesty and integrity are only to be found in corporations controlled by men of honesty and great honor. But what about the Equitable Life Assurance Company? There is no more dishonesty or graft in political life to-day than there is in a corporation or private concern. In political affairs you have an ever watchful press to expose and often to magnify the evils thereof. They have not the same opportunity to expose graft and corruption in private affairs, and they do not become public.

Public utilities can be owned and operated by the municipalities under political conditions with just as great a degree of success as under private ownership, Mr. James Dalrymple to the contrary notwithstanding. I do not pretend to say that the political conditions in our municipalities are ideal. But the conditions in our American municipalities are peculiar to themselves, and do not need the Dalrymple theory or practice. What we need to-day are the American Dunne of Chicago, Tom Johnson of Cleveland, or a Hiram Phillips of St. Louis to meet and overcome conditions as they now exist.

St. Louis owns and operates its water-works system under

political conditions, and there is no better or more successful system in the country. Since the establishment of the city hall lighting plant, the city has installed three other light and power plants; one at the water-works, furnishing light and power to three stations located within a distance of seven miles and operating a street railway, connecting each station. The current has been generated for 1-2 cent per kw hour. The other two plants are located at the insane asylum and at the new city hospital respectively; they will consist of fourteen buildings when completed. They are also operated with success.

Political Help

My personal preference in the employment of help, especially in mechanical pursuits, would be to establish a sound civil service system requiring a new examination every two to four years. At the same time, I do not hesitate to say that with all our political evils we have a class of help, employed in part by political recommendations, as honest, faithful and loyal as any private interest could secure. Of course, much depends upon the head of the department. In my department, I tell every man employed to read certain fixed rules posted in the plant, and if he cannot abide by every rule, not to go to work. He is given further to understand that while politics may assist him in securing a position, politics would not help him to hold it if he did not attend strictly to his duties.

In closing this address, I desire to impress you with the thought that these few remarks are not the result of idle thoughts of doubtful value, neither have I endeavored to build any castles in the air, but what I have said is based upon a combination of sound theoretical and practical knowledge of the conditions and requirements. How well I have succeeded I shall leave others to say. Before you leave this meeting for your respective homes I believe you will have resolved to be more aggressive and progressive in municipal work, and that this work should be done by the municipality, to the end that the lives and the homes of the whole people may be made brighter and happier thereby. It should not be done by private or corporate interests for the enrichment of the individual. Your resolution may be high sounding for the future, but let me remind you, in conclusion, that nearly every municipality has a public service corporation that has fastened its claws into the vital organs of the community. It may be water, electric light, gas, street railway or a combination of these public service corporations—it matters not which—their methods and results are the same. The corporation is ever ready to debauch or defeat the public officials who seek to check its depredations. By employment and princely fees it throttles the lawyer who is in a position to do it great harm. In financial matters it waves the big stick over the banker, the manufacturer and the business man, and the entire people are bled to fatten these products of American frenzied finance. There is no single source of social, industrial and political corruption that is one-half so sinister as the American public service corporation under its present methods of management. Gentlemen, forewarned is to be forearmed. Then I say, beware for the future.

THE SEWERAGE OF SALEM, MASS.

The extensive sewerage works now being carried out by the city of Salem, under the supervision of Mr. Ernest W. Bowditch, of Boston, as chief engineer, are the outcome of many years' study and discussion. The insanitary condition of the North River and the tidal flats has long called for remedial measures, and it had been hoped that the action of the Massachusetts State Board of Health, in undertaking a detailed survey and the preparation of a complete scheme, in 1895 and 1896, would have earlier borne fruit. The scheme then propounded included the adjoining town of Peabody, and made provision for a maximum sewage flow of about thirty-one million gallons per day from an ultimate population assumed at 102,000, together with extensive industrial establishments.

Joint action being found impracticable, the works are now being carried out by the city of Salem alone, but the original sewer capacities are adhered to, so as to provide for Peabody. That town is under agreement to pay Salem $150,000 on the completion of the trunk sewer up to the dividing line between the two areas, and is getting ready to carry out a complete sewerage system within its own district, for which plans have been prepared by Messrs. Snow & Barber, civil engineers, Boston.

The works now under execution include a total of nearly five miles of sewers, the largest being six feet in diameter; of this length, nearly two miles consists of thirty-inch cast-iron outfall pipe, laid in the bed of the harbor, the sewage being pumped through this, to the selected point of discharge in the outer harbor, by electrically operated centrifugal volute pumps. The initial installation of pumps will include four units of 125-hp each, capable of producing in the submerged outfall a scouring velocity of six feet per second.

Contracts for the pumping station and plant will shortly be let. A total expenditure of about $600,000 is contemplated.

The arrangements between Salem and Peabody include the stipulation that Peabody, in addition to the payment of $150,000 towards the cost of the trunk sewer, shall contribute its proportionate share towards the annual operating and maintenance expenses, as determined by the relative volumes of sewage. To this end, the sewage will be measured at the Peabody line and after its passage through the pumps, in the latter case by means of the well-known Venturi meter.

Mr. W. F. Bates has charge of construction, as resident engineer; the works are being built partly by contract and partly by direct labor.

PUBLIC UTILITIES

A Scheme for Their Management

*James Montgomery Rice**

The following plan for the management of public utilities is applicable to city gas works, electric light, power and heating plants, water-works and telephone systems, but, for convenience, the article is written with reference to gas works alone; the reader can substitute any other utility as he reads.

OBJECTS TO BE ATTAINED

I will mention three. First, it is extremely desirable that the operation of the gas-works should be considered and treated as a purely business matter, separate and distinct from general politics. Experience has demonstrated, without exception, that when politics enters into the management of public utilities, whether the management is vested in the city or controlled by private corporations owning the works, the effect on general politics, whether city, county or state, is corrupting in the extreme. Even national politics is more or less injuriously affected. Dishonesty in private business becomes more common and is mistaken for business ability. Unprincipled men are induced to use improper means to obtain office for what they can make "on the side" by graft. Dishonest officers are made out of men who were honest when they were elected. This combination of politics with the management of public utilities furnishes the carrion for all sorts of political vultures. Except in cases of spasmodic reform, matters grow worse and worse as the years go by, and unless something is done to prevent it this combination will eventually destroy the republic. Therefore, the gas-works must be taken out of general politics. How to do this, in the case of gas-works, will be considered later.

Second, it is desirable that the gas-works should be run in an economical business way, and gas furnished cheaply. It is a universal rule in business that, to secure economy, those who furnish the money should have control of its expenditure.

The third object is, that the service should be satisfactory to the consumers. This is best secured by giving the consumer control over the business. It is fortunate that in the case of supplying gas to the people of a city, those who furnish the money and those who receive the service are the same parties, and if we can give them the control and take the works out of general politics we shall purify the politics, cheapen the gas and improve the service.

PLAN PROPOSED

To bring this result about, let the city lease the gas-works to a corporation to be organized "not for pecuniary profit", which shall be governed by a board of nine directors, more or less, to be elected every four years by those who at that time are the subscribers for gas. As these subscribers are the parties who furnish the money, they will, of all persons, be most interested in securing economy. As the price of gas per thousand feet would be fixed at its actual cost, and would therefore be the same to everyone, the interest of all the subscribers would be the same, and it would be satisfactory if each subscriber, whether he used much gas or little, had one vote in the election of directors. This might be held at the same time and place as the general elections, in order to save the time of the voters, provided separate tickets and ballot-boxes and the Australian ballot system were used. There would be, necessarily, a separate poll-list, consisting of the names and street-numbers of the subscribers in each precinct. I am inclined, however, to think it would be better to have the elections of gas directors at a separate time and place from other elections; as the election need not occur oftener than once in four years it would not be burdensome to the subscribers for gas.

QUALIFICATIONS OF DIRECTORS

It could not be expected that each subscriber should know, or take time to learn, how to make gas on commercial lines, or even to select a person who did know, but every subscriber would know some honest business men of intelligence and ability who, if elected directors, would be able to make the necessary investigations and select proper managers for the undertaking. It must be provided that no one in any way connected with the city government or holding any political office of any kind should be a director or hold any office or employment in the proposed consumers' company, or should directly or indirectly make, or be interested in, any contract with the company or own any stock in any corporation that did so, or have any control over the laborers and other employees of the company or over their selection. The managers of the company should be untrammeled in their selection of employees. The directors need receive only small salaries, if any, for their functions would be similar to those of the directors of a bank, mill or factory. They would employ the principal salaried officers, who would be chosen with regard to their technical knowledge and practical experience in the business, as well as their ability and honesty. Such salaried officers would be responsible to the directors, and through them to the subscribers, for the management of the concern.

THE LEASE TO THE SUBSCRIBER'S COMPANY

This work is practically all done for the city. The plan would be accepted and the lease adopted by ordinance of the city council. There would be no inducement to any one

*Attorney and Counselor, Peoria, Ill.

to bring improper or corrupt influences to bear upon the council to secure the adoption of this plan, for there could be no private gain thereby to anyone.

The lease must contain all provisions necessary to protect the city as well as the subscribers for gas. The length of time for which the lease should be made would not be very material; if its terms were not complied with, it could be terminated, like other leases, for breach of covenant. The lease would provide that the managers should pay the city a reasonable interest on the cost of the works, should keep them in good repair and provide a fixed sinking fund which would replace the works or parts of them as they are worn out, besides paying the running expenses. All this would be paid out of the income derived from the gas rates, which would be placed as low as possible. If the income was not large enough, the rates would be raised, if larger than necessary, they would be reduced.

Necessary extensions to the works would be made by the city, by contracts let by public bids or otherwise, the cost being added to the capital amount upon which the subscribers' company must pay interest and provide a sinking fund.

Under this plan, there would be no private fortunes to make nor dividends to declare, for there would be no stock and no assets of the company except its right to collect gas-bills; this, however, would be a valuable asset, because of its being secured by the right to shut off the gas from premises in default. In case of cancelation or surrender of the lease, this asset would at once revert to the city, which would, in turn, have to liquidate the debts of the company, if any, out of the increased rate to be levied on the subscribers. This would be but just if the company, under their management, had contracted debts greater than the rates they had levied would pay.

Out of Politics

The plan of having separate ballot-boxes and poll-lists will tend to separate this purely business matter from general politics. No officer or employee of the subscribers' company would owe his position, or be under any other obligation, to any political officer, and consequently could not be dictated to by any. The names of candidates for the directorate would not appear on the same ticket with those of any candidates for any political office.

These provisions would permanently take the gas-works out of general politics; it is not too much to say that nothing else will do so.

Conclusion

Instead of leasing the gas-works for seventy-five or any other term of years to a company composed of a few capitalists, whose only object is to secure all the money they can out of the citizens, the plan proposed would lease them for ten or twenty years to a company whose only object and interest would or could be to get the best service for the least money.

It is very discouraging to citizens who have secured a reform in city administration after a long and hard fight, and as the result of great sacrifice of time and money, to find the method of doing business left as it was before, so that after another election or two the old corruption and graft may creep in again. A plan ought to be devised, if possible, so that the reform would be lasting. To accomplish this, it is important that the duty and the interest of the voter should coincide. Under the suggested plan, if the business were not well managed, the consumers would have only themselves to blame, and other parties, not paying any money or having any claim for service, would have no right to complain.

It is easy to devise plans which would work well if all men were honest and unselfish, but a practical plan must be based upon the theory that we are each looking primarily after our own individual interests and that there will always be a greater or less number of schemers, seeking to take advantage of the inattention of the people.

A SUCCESSFUL MUNICIPAL GAS PLANT

The report on the operation of the Manchester, England, municipal gas works during the year 1904 shows a gross profit of $734,350, out of which $207,500 has been placed to sinking fund, under the provisions of the controlling acts of Parliament. In addition, $205,100 was paid for interest, leaving a net profit of $321,750. Of this sum, $292,000 has been paid over to the city fund, that is to say, in direct relief of taxation, and the balance has been applied to the cancellation of stock and minor additions to plant.

This has been done contemporaneously with a reduction in the price of gas to ordinary consumers from 60 cents to 54 cents per thousand cubic feet within the city and from 66 cents to 62 cents beyond the city, dating from June 24th, 1904. A further reduction of 2 cents per thousand cubic feet dates from June 24th, 1905.

The total number of consumers on March 31st, 1905, was 152,165, an increase of 5,708 in the twelve months. The supply of these entailed the use of 858 miles of main, serving also the 17,361 public lamps within the city and 2,078 in outside areas. Of the total number of street lamps, 5,866, or 30 per cent., are fitted with incandescent burners.

An interesting feature of these works is the large volume of gas supplied through slot meters, operated by the dropping in of a "penny" (2-cent) piece. There are 47,865 such meters in use, through which 389 millions of cubic feet of gas were delivered during the year, yielding a gross revenue of $265,700, equivalent to a weight of nearly 117 (long) tons of bronze coinage. Gas cookers and other similar appliances, to the number of 23,862, with 1,711 gas engines, also constitute an appreciable element in the consumption derived from this large municipal undertaking.

ENGINEERING WORK IN SMALL TOWNS*

The Establishment of Grade Systems on Economical Lines

RALPH B. SLIPPY

MUNICIPAL engineering in towns of 2,000 inhabitants or less may, with perhaps the very limited exceptions of a water-works or a sewer system, be confined to the establishment of a grade system.

A city or town, to make street improvements of however small extent, must, by law, have a grade established. A few years ago very few small towns had such a system on record, or if indeed they had, the maps and profiles were carefully preserved in the vault of the principal bank, and while they accumulated the undisturbed dust of years of disuse the street commissioner and town council, in blissful ignorance of the very existence of such things, cut and slashed, graded and regraded, until some irate property holder called a halt.

Fortunately, this rule and order of things that be has given way to a desire on the part of the citizens of the smaller towns to imitate their larger neighbors and replace their plank walks with those of cement. A little experience at guessing has led to a demand for the services of engineers. And yet there is room for improvement and too often the work is left off just at the time that the town is ready to derive the benefit accruing from a grade system. With any other class of engineering work it would seem a queer procedure to have plans and specifications prepared, start on the work in accordance with the plans, and then let the foreman go ahead as though there had never been a plan. Yet this is exactly what is done in many cases with a grade system. The principal reason is the failure of the average citizen to realize that the engineer of experience is better fitted to fix grades than he is; consequently he does not want to spend the money for engineers' services. After the first plans are made the property owner is allowed to change the grade as he desires until the plans are worse than useless, for if the town again attempts to establish a system, corresponding with the improvement put in, it becomes liable to damage suits over the necessary changes of grade.

These are not an array of fancies, but are facts which I dare say have come within the observation of every engineer experienced in municipal work. There are still many small towns which do not have even the scratch of a pen to show that they ever thought of a grade system, and when we find one that has gone to considerable expense to provide a creditable plan of improvement we like to speak of it as an example of what all towns should do. The writer has established the grades for several towns in the past season, but will describe the work done at Ackley, Iowa, as a good example of what other towns can do when they cannot get an engineer to set a little sidewalk grade except at an expense too great for the amount of work.

Ackley is a town of about 1,700 in Hardin County, Iowa, at the junction of the Illinois Central and Iowa Central railroads. In the spring of 1904 a special election was held to determine the advisability of having a complete re-survey of the town for establishing both the property lines and the grades. The proposition "Shall the survey be made and the grade established" was carried by a small majority, which would have been larger but for the predictions of the opponents of the measure, who claimed that the work would cost the town from $1,500 to $2,000, in addition to an untold amount in defending law suits. On May 24, in response to a request to furnish an estimate of the cost, the writer visited the town and entered into a contract to perform the work at a stipulated rate for his own services, the town to pay all other expenses. The question as to what monuments to use was discussed at considerable length. The town council desired that the grades be marked in some permanent manner, as the expense of getting an engineer would be almost prohibitive, on account of the very small amount of work that would be needed in the future. The writer proposed cement block monuments, though the danger of their being moved by frost and by interested parties was fully presented. The cost of the whole work of making the survey, establishing the grade, and of setting a cement block monument at each block corner was estimated at $650.00, which proved to be not far from the actual cost. The monuments themselves cost 14 cents each, or a total of $70 for the five hundred required. They were made by a local cement worker, who used a wooden box form in the shape of the frustum of a square base pyramid, the top being 3 in. and the base 6 in. square. They were 24 in. long and weighed about 40 lbs. each. A forty-penny spike, placed in the top of each block while the cement was green served to indicate the precise line of the survey.

The survey of the town was undertaken first. After the government corners and the few monuments recorded on the original 1857 plat had been found, the center line of each street was run and temporary stakes were set at the exact intersection of the center lines of the cross streets. The temporary stakes were made from hard wood lath of the kind used in building fences and were cut in foot lengths, tack pointed. From these intersection stakes, temporary stakes of the same kind were set at each block corner. The transit was set over the intersection peg and line taken to fixed sights on each street and a pin set 35 feet each way by measure and carefully lined in, 35 feet being one-half the width of the streets. From these pins the block corners were set by meas-

*Part of a paper read before the Annual Meeting of the Iowa Engineering Society, by Ralph B. Slippy, Civil Engineer and Surveyor, Waterloo, Iowa.

ure and the temporary stakes set. The angles between the street lines were read and recorded as a check on the work.

Following the survey, the preliminary levels were run and the grade system worked out. On the grade map were given the grade for the crown of the street, the curb grade for each curb corner within the limits of the intersection and the walk grade for each corner when this was not set to the walk grade. On account of the great number of figures necessarily appearing on the grade map the surface elevations were not given, these being shown on the profiles. The profiles were made for the streets in both directions, and showed the grade line and surface profile of the center line of the street in black ink, with the profiles of the side lines of the street in colored ink, and gave also the elevation of the cement walks already laid.

Having the grades thus worked out in detail the next step was to distribute and set the grade monuments. The temporary stake was first "pegged in" and then the hole was dug with a post auger or spade to the proper depth, as determined by the level and rod. The top was then placed so that the spike head was in exactly the correct position as regards line and grade and the earth was then stamped around the block. It was found that the best time was made with three men to dig the holes and set the monuments, forty blocks being an average number set in a day with this force. The work of getting them to the exact level was not nearly so great as expected, as after setting a few the men could set them with about the same number of trials that a stake could be driven to grade, although the work of lifting them was considerably heavier, owing to the weight of the blocks. It was found that where the blocks would have to extend more than about one-third of their length above the ground, it was better to simply set them in and record their elevation. A number had to be reset because of their being too easily moved, when held only by a mound built around them.

The town council provided an ordinance requiring all improvements to be made in the future with reference to this survey and made it a misdemeanor to disturb the monuments except to use them legitimately. The grade ordinance itself established the grades in one direction only, but made the grades of the cross streets to correspond with the grades of the streets named in the ordinance, as shown by the grade map and profiles on file with the city clerk, thus saving a considerable item of expense in advertising.

This is a somewhat detailed description of a system that will be approved by the town councils of many of the smaller towns. It will undoubtedly meet with objection among many engineers, in that it delegates the work of setting walk grades to those not competent to do so. At the same time, it must be admitted that any one who could not set a walk grade when he has a monument at each end of the block and has the elevation given on the grade map with the proper grade for the corner would not be able to use engineers' stakes if he had them. Any good cement worker can get a very good grade and line without the use of any instruments other than "pointers."

As regards the design of a grade system, it is a question passed over by a great many engineers without much attention to very important details. Grades are often established which do not provide sufficiently for drainage, a most important consideration in the writer's belief. The minimum grade should be not less than one in four hundred, although we sometimes must be satisfied with less. It is no serious mistake to place one side of the street higher than the other, but the difference should not be more than two feet between curbs. A greater difference can be obtained by terracing between the walk and the curb. If this is done, however, care should be taken to prevent too steep an approach from the cross streets and alleys. A width of from thirty to thirty-six feet between curb lines is ample for most small towns, though the tendency is to make this greater. Deep side ditches are unnecessary. In one town in which I established grades in the past season, the town council wanted me to lay out a system of ditches to cover the whole town, and it was only after considerable argument that they were convinced that if the streets were properly graded the water would find its way out. This one occurrence, strengthened by ideas equally absurd, which I am continually meeting, convinces me that there is much room for education before we as engineers find municipal engineering in small towns entirely satisfactory.

THE CITY BEAUTIFUL

THE mayor of Denver, Col., desires to secure the cooperation of the citizens in an endeavor to beautify and clean up the city, and has issued a direct appeal to them, containing many suggestions of general application. Among these we find the following: If your store front, residence or fence is dull or dingy, order it painted; if your awning is old, torn or faded, get a new one; if your sidewalk, fence or gate needs repairing, fix it; destroy the young weeds that are starting on your property, and on your neighbor's property; if your advertising sign is old or faded, take it down and paint it; resolve never to throw paper in the streets; take all dandelions out of your lawn, they spoil its beauty; burn all the rubbish possible, allow no one to throw it on the streets, alleys or vacant lots; promise not to spit on the sidewalks; organize a block improvement society, and allow no weeds to grow on sidewalk area or vacant property in your block; ask your milkmen, grocerymen and expressmen to have their wagons painted; irrespective of the size of your house, make your lawn the finest; illuminate the front of your store in the business section. Every effort put forth, or a dollar spent to improve our city's appearance, will be returned twofold. It is claimed that these suggestions have been cordially carried out by the people, and that they are delighted with the results.

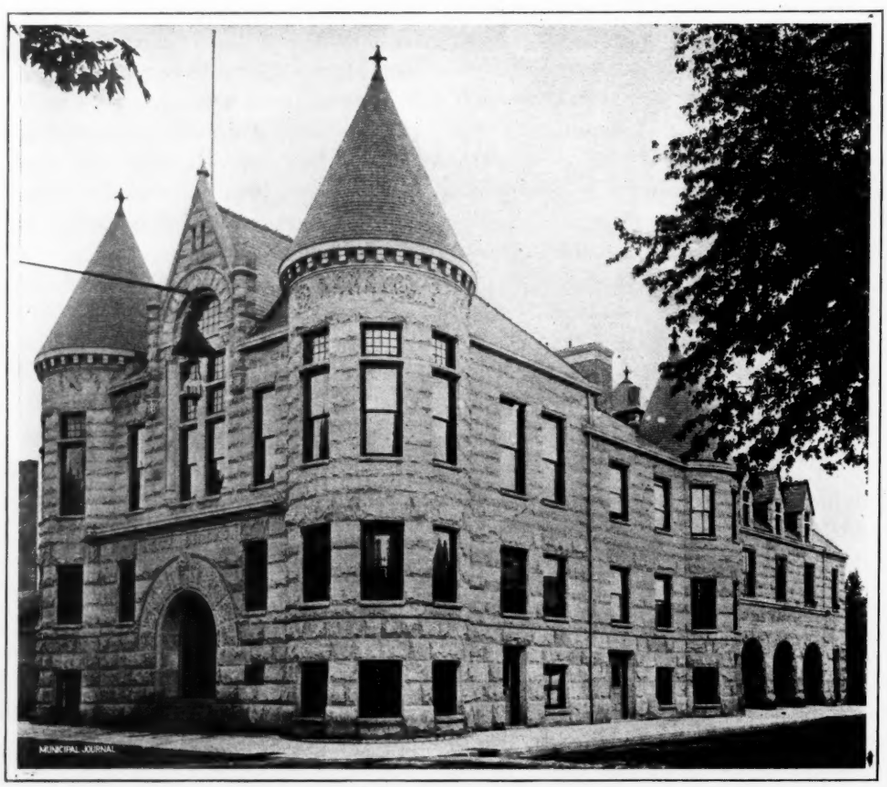
A PROGRESSIVE INDIANA CITY

Some Municipal Features of Kokomo

M. A. BROUSE, Mayor

KOKOMO, one of the most thriving and prosperous inland cities of the state, has a population of 20,000, and maintains a steady growth. Realizing that the commercial success of Kokomo must depend upon other advantages than those accruing from river or lake—the natural arteries of commerce—the leading spirits of the city's early days were gladdened, as far back as 1849, by the building of the first railroad, now known as the Lake Erie and Western. This road, with the P. C. C. & St. L. and Clover Leaf, makes Kokomo highly favored in the matter of shipping facilities over steam roads. The Indianapolis Northern and Kokomo, Marion & Western interburban lines afford facilities of the utmost importance.

Attention has been given to manufacturing interests until to-day Kokomo, in this respect, is comparable with numerous larger cities. The Kokomo steel and wire plant is able to give effective competition to the Carnegie steel corporation; the factory of the Pittsburg Plate Glass Company is one of the best operated by that organization; the Great Western Pottery Works, the manufactory of the Kokomo Rubber Company and the automobile plants of Apperson Brothers and Haynes-Apperson are known the country over. These are but the larger of Kokomo's manufactories, which in the commercial world occupy places of chief importance.



CITY HALL, KOKOMO, IND.

The stranger visiting Kokomo is at once struck with the eminent social spirit of her people. Sojourners fall in love with the place and its people at once.

Mayor M. A. Brouse, while one of the youngest executives of the state, has administered the duties of his office with the sound judgment and conservatism that accompany age and experience and at the same time with the energy and enthusiasm of youth, and has consequently enjoyed the confidence and admiration of his entire constituency. Personally he is very popular, and his easy yet dignified social manners quite put him on a favorable footing with all whom he meets, besides giving to his office a personality much appreciated by the community. He was elected to the common council from the First Ward in 1900, and was promoted by the people to the position he now occupies with such marked ability and success. Mayor Brouse is alert to all new interests affecting the municipal life and takes the initiative in their consideration. He extends this watchful solicitude to every commercial and business interest lying within his jurisdiction. Mayor Brouse is a constant student of municipal problems, and gains valuable information, of service to his constituency, by attendance upon municipal associations and gatherings. He is a staunch advocate of the municipal ownership of the water system of Kokomo. His basis for this position, while unique, is sound in reason. He holds that it is as much the duty of the municipality to furnish cheaply to its consumers pure water as it is for the city government to educate the children in the public schools. In waging his fight upon this issue, the mayor and common council secured water rates which were of advantage to consumers and especially to the city. The hydrant rental now stands at $25 each, annually, for every 500 feet of pipe laid. The water com-

pany is also completing improvements which will make their plant one of the best in the state.

Mayor Brouse has made an unusual record for a young executive. While he has full confidence in himself, as a man of action should have, he is not afraid of advice and seeks it upon every important occasion. One of his best traits is his ability to appreciate good advice when he receives it. He has kept in harmony the various interests subject to his direction, and while firm and very hard to

HIGHLAND PARK, KOKOMO

deceive is always inclined to a safe and honorable compromise. He is prompt in the perception and discharge of duty, and knows neither friend nor foe in its performance.

Beautiful Crown Point cemetery at Kokomo, one of the finest burial grounds in the state, notable for its soldiers' monument, a shaft towering 200 feet in the air, is a conspicuous example of Mayor Brouse's idea of the public ownership of necessities.

The cemetery owes its chief excellence to its continuous management by Hon. John W. Cooper, who has held the position of superintendent forty years. This cemetery has been of no cost to the city from the very start, the sale of lots being an ample source of maintenance.

Realizing that manufacturing is one of the most important factors in a community, Mayor Brouse takes a deep and abiding concern in the welfare, prosperity and growth of that interest. He keeps himself in touch with its representatives, and with what intimately concerns them, and all this in a helpful tactful way which is appreciated by all.

Public Schools

Kokomo is in the front rank in the matter of school buildings and equipment. There are eight buildings in use, having a total value of $250,000. The High School building is a massive structure, of fine appearance, and has a beautiful assembly room which will readily accommodate 300 pupils. There are sixteen recitation rooms and a good sized gymnasium.

The Central Building is as fine a building of its class as any to be found in the state of Indiana. It is a complete embodiment of all the sanitary ideas of the day. The interior decorations are very beautiful, and the architecture is of a very chaste character, and appeals to the eye in a very striking manner. It comprises twelve rooms, the eighth grade assembly room, and two offices and teachers' rest rooms.

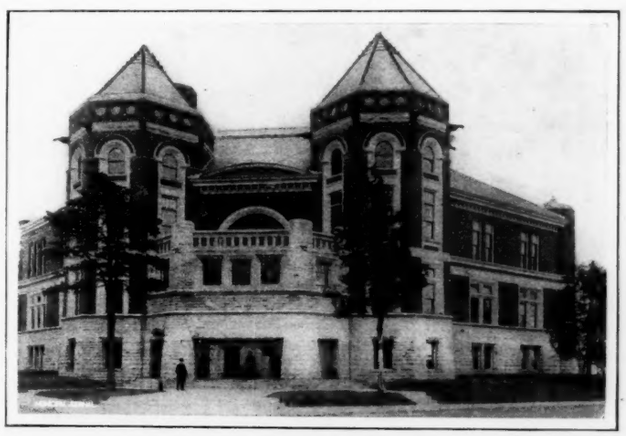
The Lincoln, Columbian, Meridian and Palmer buildings are all excellent modern eight-room buildings.

The school enrollment of Kokomo is 2727. There are sixty-four teachers, whose salaries in the school year of 1903-4 amounted to $33,034.85.

Highland Park

The mineral waters which flow from the wells of the beautiful city park have justly acquired a fame for their healing properties. The fact that so many people assert they have derived benefits from them, even in aggravated troubles, and that the water can be had for the labor of carrying it away, has made the demand out of ordinary proportions. It is a daily sight to see people drive up to the well houses and fill their jugs with the pure crystal beverage, or to sling a jug across their shoulders and board a car for the city. The claim is made that these waters afford the best possible relief in Bright's disease and rheumatic troubles, and that disordered stomachs yield to their influence.

Highland park, in which these wells are situated, is a place of great natural beauty. An area of thirteen acres of woodland upon a hill side, through which a small stream glides, has, under the care of the landscape gardener, yielded remarkable results. As a floral display the park would be hard to excel. It is a Mecca of picnic parties, and especially church and lodge outings, for miles around. These bodies make use of the interurban railways entering Kokomo to secure entrance to the grounds and enjoy the rare pleasures of a breathing spell under the shade of the handsome specimens of the forest, with refreshing draughts from



HIGH SCHOOL, KOKOMO

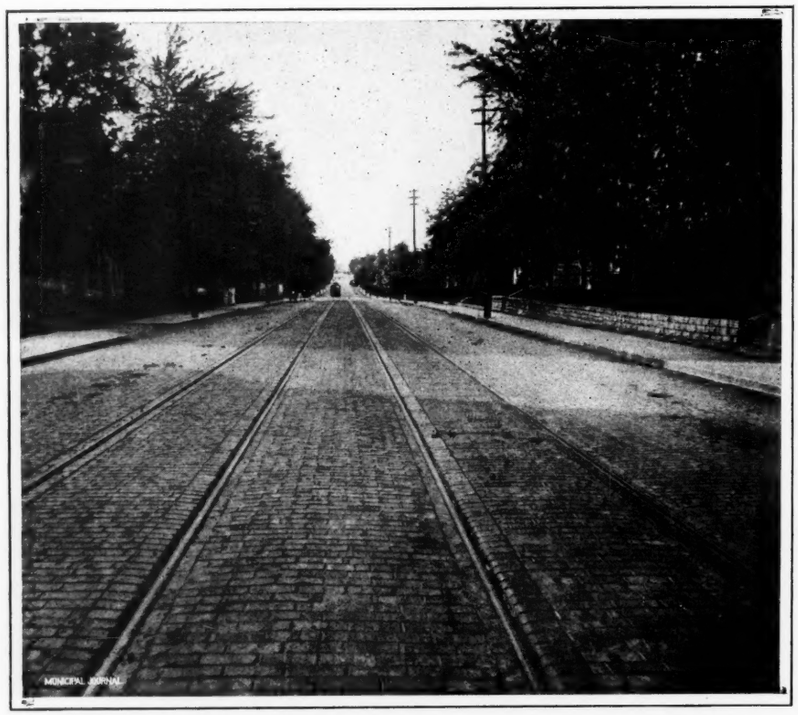
the deep driven wells. Fashionable automobile parties follow the same quest, and spin up to the well houses after a run along the drives.

The pen of poet, or the skill of the artist, is inadequate to describe the beauties Highland park assumes when the chilling blast of winter has stripped the beautiful foliage from her trees and when the tall sentinels stand out in mute protest against the skies. The gay fantasies of the summer are rivaled, only the winter's touches are more majestic,

and have in them the suggestion of the boldness and irregularity of power. But in the spring, when bud and bloom burst forth, the people begin to visit this scene of beauty and with book or camera or the brush of the artist seek an analysis of its beauties. As no expense is spared to add to its attractiveness, it is destined to be one of the most delightful spots to be found within the confines of the Hoosier state.

CARNEGIE LIBRARY

The Kokomo Public Library was organized under the School Library law in December, 1885, forty volumes being the first purchase. A tax of one cent on every hundred dollars valuation was levied for library purposes; this has since been increased to three cents. Mr. J. C. Leach was chosen as the first librarian, in which capacity he served until 1898, when he was succeeded by Miss Moreland, she in turn being followed, in 1900, by Miss Eva M. Fitzgerald. Since its organization the Library has had a steady growth and now numbers 10,728 bound volumes and over 300 pamphlets and unbound periodicals. The past year there were loaned 43,000 volumes, and nearly 14,000 people availed themselves of reading room and reference privileges.



SOUTH MAIN STREET, LOOKING NORTH—KOKOMO

In 1903 a gift of $25,000 was accepted from Mr. Carnegie for a library building. The library trustees, who are also the school trustees, took advantage of the special school tax and from it purchased a lot upon which to erect this building. A one-story classic building of Bedford stone was erected at a cost of $32,000. A staff of four is required for the proper administration of the building, the annual cost of its maintenance being about $1,700. The library is open each week day from 9 A. M. to 9 P. M. and on Sundays from 2 to 9 P. M.

A feature of the building is a club room in the basement, where various literary clubs hold their regular meetings.

Miss Eva M. Fitzgerald, the librarian, has had wide experience in this work and possesses excellent ability for the direction of an institution of this character.

J. Frank Bruff, a Kokomo architect, designed the building.

UNIQUE AND INEXPENSIVE GARBAGE PLANT

Kokomo is provided with a unique and inexpensive garbage plant. While other municipalities are put to an expense of several thousand dollars annually for the disposal of garbage, or have to incur heavy cost in the establishment of a destructor, or other equipment, Kokomo has an outlay of but $370 a year for the care of the offal of the city. The garbage farm, nine acres in extent, is one mile west of Kokomo. It is under the direction of Dr. J. L. Puckett, secretary of the Board of Health and Charities, who has the control of the superintendent, J. W. Keller. All refuse matter is hauled from the city in wagons and buried in the ground in accordance with prescribed rules. Dead animals are also interred here. The experiment has been a complete success from an economical as well as a sanitary standpoint, and the land, while being enriched, is also increasing in value. There is a substantial residence upon the farm which, when occasion presents itself, is utilized for a pest house.

MODERN MACADAM ROAD CONSTRUCTION

Palmer street is typical of the best macadam construction to be found in Kokomo, and embodies the best and most practical ideas on the subject. It is an ideally built macadam street 2,400 feet in length, paved thirty feet between curbs, with 8-ft. parkways, 18-inch grass plots next the property lines, 5-ft. cement walks, and with a maximum gradient of 5 per cent. The subgrade was built true to grade, thoroughly rolled with a twelve-ton Kelly Steam roller, owned and operated by Walter J. Dixon, the contractor for the improvement. The subgrade was covered 6 inches deep with crushed limestone 2½ inches in gauge, and rolled and re-rolled from twenty to forty times until the stones did not wave ahead of the roller and until each stone was wedged in position. The stone being of only a moderately hard nature, considerable dust and chippings resulted and assisted in no small measure in filling all interstices and forming a very solid crown on the first course. The second 6-inch course consisted of stone crushed to 1-inch gauge and spread to grade, measured by ordinates from a line stretched between the two curbs. This layer was heavily rolled until the stones ceased to creep, then chips and dust were applied and rolled in dry until no more would be taken up by rolling. The rolling was continued, a water cart preceding the roller continuously, until the roadway was thoroughly saturated. Any points showing that the filler was washing in were again covered with dust and re-rolled until the surface was one mass of stone. The last layer was rolled from forty to

sixty times, until almost as smooth as an asphalt pavement. After two years' wear no raveling or breaking up has shown and very little rutting is to be seen. The street is noiseless and fairly free from dust, and is an ideal residential street. The local limestone is not of the hardest, but is rather tough, and this is one of the essential qualities in road building. Good macadam pavement can be made of it if the proper methods are employed, and these consist in the proper combination of stone, stone dust, stone chips, water and rolling.

Main Street Brick Pavement

South Main street, a length of 2,800 feet, was improved by paving with vitrified paving blocks manufactured at Veedersburg, Indiana. The foundation consists of the old macadam roadway, which was thoroughly cleaned of all rubbish and dirt and then trimmed to grade. All depressions were brought to grade by using fine stone and stone dust. The foundation was systematically and heavily rolled, beginning at the edges and rolling progressively toward the center with a 12-ton Kelly Steam Road Roller, as in the case of Palmer street. The central portion of the street is occupied by the Kokomo Railway and Light Co.'s double-track street car line, laid 10'-2½" center to center. The rails are seventy pounds to the yard, laid on oak ties, resting on 6 inches of crushed stone and stone dust thoroughly tamped. "Nosed" bricks are used between the rails next the gauge lines, the 3-inch bevel being curved, not straight. The curved bevel brick is much preferable, as the wheel flanges do not cut or crush the nose as in the case of the straight bevel. The cushion is 1½ inches deep. The paving blocks were laid in regular lines at right angles to the axis of the street. Laying the bricks between the car lines at right angles to the street is greatly preferable to laying them longitudinally, as a better and neater job can be done, but most contractors insist on laying them lengthwise of the roadway, as it requires less cuting of the bricks. A sand filler was used in preference to cement for several reasons; first, on account of cheapness, the cost varying from 1½ to 2 cents a square yard; second, bricks can be taken out and replaced; third, it is much less noisy than a cement filler. The sand filler was thoroughly brushed in by dragging a small bushy topped tree over the surface with a span of Shetland ponies; the ponies being light and unshod did not displace or disarrange the bricks. The roadway is paved forty-four feet in width, the paving being carried directly to the curb, as no gutters were built.

The cement sidewalks are eight feet wide, including the foundation, 16 inches in depth. The stone foundation, eleven inches in depth, was rolled with a five-ton horse roller. No curb was built, or rather, the curb was built as part of the walk and may be properly termed a combined walk and curb. The face of the walk is carried down twelve inches deep and made six inches thick. On the margin of the walk is marked off a 6-inch strip in imitation of a curb. The surface of the walk was broomed, giving it the appearance of sawn stone. The walk is a handsome and substantial one and will last a generation. The total cost of the street, including sidewalks, was $8.88 per running foot.

♠ ♠ ♠ ♠

A Noteworthy Experiment

A recent issue of the Oakland "Enquirer" directs attention to a new departure entered upon by the city of Houston, Texas, in connection with an endeavor towards municipal retrenchment. The city was formerly divided into six wards, two aldermen being elected from each ward, and the offices of mayor, city assessor and collector, city attorney, street and park commissioner, chief of police and city treasurer, were also filled by popular election. A proposition to amend the city charter, abolish ward lines and provide for the election of only a mayor, city controller and four aldermen at large was submitted to a referendum vote of the people and carried by an overwhelming majority. The people were generally in favor of the initiative and referendum in connection with this change in the charter, but it failed of being submitted and a modified proposition was submitted, requiring simply that all grants of franchises be first submitted to the people and ratified by a referendum vote. Those in favor of the complete referendum system, however, are organizing to amend the charter in that respect. The change in the form of city government, it is believed, will effect economy and centralize responsibility for the administration of the city, and with the referendum it is believed that this would be sufficient elective municipal machinery.

Sewage Disposal in Massachusetts

The latest annual report of the Massachusetts State Board of Health shows that while sewage purification plants have been installed in considerable number, many of them are now too small to accommodate the larger flow of sewage arising from the increase of population. In some cases the evil has been intensified by the improper construction of sewers, resulting in an excessive infiltration of ground-water into them, and a similar result has been brought about by the ill-considered use of sewers for the reception and discharge of rainfall. These conditions have led, in some instances named, to the sewage being allowed to remain wholly or partly untreated at times when the flow is very large, especially in winter and spring, the untreated sewage then flowing direct into convenient water courses.

The investigation of sewage and water purification methods at the Lawrence experiment station, which has made the work of the board known in every civilized community in the world, is being unremittingly continued. Some of the sand filters have now been in operation for sixteen years; special attention is being devoted, in recent years, to methods of increasing the rate of filtration, the success of which would mean the possibility of providing for larger populations upon otherwise insufficient areas.

MUNICIPAL JOURNAL AND ENGINEER

Published Monthly by
THE MUNICIPAL JOURNAL PUBLISHING COMPANY
140 Nassau Street, New York

JOHN S. HODGSON, C. E., - - - - - - - - - - - EDITOR
EMIL KUICHLING, C. E., - - - - - - - ENGINEERING EDITOR

JOHN B. BENNETT, - - - - - - - - - BUSINESS MANAGER
E. J. BUTTENHEIM, - - - - - - - - ASSISTANT MANAGER

TERMS OF SUBSCRIPTION
(Payable in Advance)

United States and Canada	$3.00 per year
Foreign Countries	3.00 "
Single Copies, each	.25

Special rates given for clubs of ten or more.

Make all checks payable to The Municipal Journal Publishing Company

Entered at the New York Post Office as second-class matter

NEW YORK, SEPTEMBER, 1905

Water Filtration

A RECENTLY published interview with Dr. Darlington, health commissioner to the city of New York, serves as a reminder that, while the necessity and advantages of water supply filtration are adequately appreciated in technical circles, there is no general recognition in America of the fact that this adjunct to water-works plant will have to be largely provided within the next few years. This will be found to apply not merely to new works, yet to be constructed, but in a large measure to existing sources of supply from drainage areas once regarded as entirely safe from the growing menace of pollution.

So far from the artificial filtration of water being more or less a problem requiring solution, Dr. Darlington points out that it is in use in nearly every large European city. He describes what is known as the English filter-bed system, the beds consisting of a reservoir partially filled with layers of gravel and sand, the latter material forming the upper layer of from three to four feet in thickness. The downward passage of the water through these materials results not only in a thorough clarification of the water but in the removal from it of all but an infinitesimal percentage of the bacteria originally present.

Although not referred to as such by Dr. Darlington, it is none the less true that the most powerful factor in this process of bacterial elimination remained a sealed book until within a comparatively recent period. It is now known that the formation, on the surface of the bed, of a jelly-like film is responsible for the interception of the greater part of the bacteria; as stated by Dr. Darlington, more than 99 per cent. of the whole can be thus arrested if the rate of filtration is not too fast. The filter is not in ideal condition until this film has formed, and when it is destroyed by the necessary raking or skimming of the upper thin layer it is desirable to run a certain amount of water to waste, through the filter, for the purpose of re-establishing the film.

As regards the rate at which the water should be passed through the filter, Dr. Darlington places it, on competent authority, at 2,500,000 gallons per day for each acre of bed, a figure, we may add, equivalent to rather less than four inches of vertical descent per hour. The tendency in well managed English plants has been, for many years, towards a slower rate of descent than the six or eight inches per hour once thought satisfactory, and it is recognized, where exceptionally turbid or impure waters have to be dealt with, that even the rate singled out by Dr. Darlington may require modification. The filters can remain undisturbed for about a month in summer and twice that time in winter, and require entire renewal when the sand layer has been reduced, by successive scraping, to one or two feet in thickness.

Climatic considerations have much to do with the problem of water filtration in the United States as compared with European practice. In England and most continental countries the beds can be left uncovered, but this is impossible in severe winter climates. Dr. Darlington points out that, in 1904, Manhattan and Bronx used 300,000,000 gallons of water per day, and that filters capable of dealing with this volume have been estimated at $18,227,000, which he regards as not an excessive price to pay for the certainty of a pure and safe water supply for a city of four millions. This estimate, however, takes no account of the cost of maintenance and renewals.

While the advantages of filtration are widely recognized among experts and ordinary water consumers in the localities concerned, perhaps the most effective demonstration of its value was that afforded by the outbreak of cholera in Hamburg, Germany, a few years ago. In this instance, a sharp line was drawn between the inhabitants of districts to which filtered and unfiltered water was respectively supplied, the former remaining practically immune from infection. This particular epidemic had much to do with establishing the value of the gelatinous film on the surface of the filter, and gave to scientists like Piefke an opening for research of which full advantage has been taken. In this, as in many similar respects, the United States occupies the favorable position of having been able to stand aside, her needs being less urgent, while problems involving tedious delay and enormous expenditures were being worked out elsewhere.

Philadelphia

THE action of Mayor Weaver of Philadelphia, in giving publicity to a letter of Major Cassius E. Gillette, will reassure many citizens in regard to a matter of grave importance. Major Gillette, it will be remembered, is chairman of the corps of engineers to whom the probing of boulevard and water-works contracts has been entrusted, and attempts have apparently been made to "draw a red herring across the trail" by having it understood that the investigation would delay the completion of works sorely needed by nearly a million and a half of people now compelled to use river water of more than doubtful purity.

Major Gillette states unequivocally, in his letter to the mayor, that the proposed thorough investigation of the work already executed will not in the slightest degree delay the date at which filtered water can be furnished; he shows, also, that the real cause of the delay which must take place lies in the physical impossibility of obtaining, by a stroke of a magician's wand, the large quantity of cast iron pipes required for the distribution system and the pumping machinery also needed. Contracts for the former item, including a large quantity of 60-inch pipe, have not even been placed, nor has any appropriation been made for it. Incidentally, there appears to be at least a suspicion that the low-service pumping station and the distribution system were purposely left to the last by those formerly in power, in order to force an enormous aggregate expenditure. The mayor, in a recent interview, significantly remarked that "you may draw your own conclusions as to that," but, if it were so, it would be no more than one would expect after revelations which go to make up a record story of American municipal graft.

It is a source of satisfaction to municipal reformers to find that the results already brought about in the Quaker City are not made the excuse for what might, without any stretch of generosity, be regarded as pardonable inaction. Mayor Weaver's suggestion that Philadelphia might ultimately be driven to instal a municipal lighting plant is probably to be credited with the reduction of three cents a night in the Electric Company's bid for street lighting in the year 1906, a change involving an annual saving of $118,000. The same unweariedness is well-doing is manifested in the result of a second canvass of the city's voting lists, which shows 60,083 fraudulent names as compared with 31,749 reported after a former investigation made at Mayor Weaver's request. It seems as if the city departments and officials have realized the manner of man they have to deal with, and that the days of official evasion, whether barefaced or polite, are at an end.

Typhoid in Brooklyn

WHILE it is satisfactory to learn that the Health Department of New York City is dealing energetically with the outbreak of typhoid in the Bath Beach, Bensonhurst and other areas of Brooklyn, there are some features of the case which show the need of more than merely temporary measures, designed to establish the facts and, incidentally, to reassure the inhabitants of the affected districts.

It appears that Dr. Charles W. Barry, an officer of the department, has reported the existence of overflowing cesspools, defective sewers, stagnant pools receiving the drainage of adjacent areas, and wells and cisterns exposed to pollution. Most of these items would probably be duplicated in any sanitary investigation, with differences only in degree, but it is when Dr. Berry takes up the question of remedial measures that the seriousness of the situation is revealed. His advice to prohibit the building of new cesspools shows, for instance, that Brooklyn's ideal in the matter of sewerage provisions is far from Utopian, for it is an accepted canon of constructional hygiene that the retention of sewage within the community by which it is produced is inimical to the elementary rules of public health. Surely the existence of "nearly three hundred unnecessary cesspools within the district" is a sufficiently grave matter, and yet, judging from Dr. Barry's recommendation, there is at present no adequate power to prevent potential additions to the number. It cannot be too strongly enforced that one of the chief aims of tubular sewers is to obviate the necessity for perpetuating such a system of storage.

The strongly urged prohibition of bathing along the shores of the affected suburbs, no less than the apparently substantiated connection between cases of illness and this cause, cannot be disposed of by methods analogous to those discussed above. Some day, no doubt, the question of sewage disposal for the enormous population of what may be termed the metropolitan district will have to be seriously and effectively dealt with. We do not mean by this that any of the various systems of land treatment will have to be resorted to, but that the entire volume of sewage must be discharged, with or without preliminary treatment, through a limited number of sea outfalls at carefully selected points. From a financial point of view, it would doubtless be expedient to postpone that step, if in any way possible, for the better part of a generation, due regard being paid, in the meantime, to the necessity of allowing the construction of remedial works on the broad lines of existing methods, modified by present-day knowledge, for such communities as are in need thereof. There is nothing in this to prevent the steadfast keeping in view, at every stage, of the ultimate necessity for amalgamating individual undertakings, and especially their respective outfall works, into an harmonious whole when the proper time arrives. On that account, if on no other, it is to be regretted that the opposition to the Passaic Valley scheme of sewerage, designed to provide these greatly needed facilities for Patterson and other crowded centers, should have been so far successful as to hang up, apparently indefinitely, a project of far-reaching importance to an enormous area and population.

Traffic Facilities in London

A ROYAL COMMISSION, appointed two-and-a-half years ago to inquire into the transport facilities of London, has recently issued the first fruits of its labors in the shape of a general report, to be followed later by seven volumes of details. Although the commissioners are not absolutely unanimous in their conclusions, there can be no question that the report occupies a commanding position as an authoritative exposition of the needs of Greater London in regard to the means, existing and required, of transport and locomotion in that unique area of nearly seven hundred square miles. The population within those limits in 1901 was six and a half millions, and the problem is complicated, so far as passenger transportation is concerned, by the growing recognition of the fact that no effective solution of the perennial housing difficulty is possible except in the direction of providing "working class" dwellings at a distance involving rapid and cheap transit facilities for those concerned.

The conditions prevailing in the English metropolis vary so much from those with which American municipalities are more or less familiar that we do not propose to discuss the report in any detail, but it may be noted that a sub-committee of the general body visited New York, Boston, Wash-

ington and Philadelphia and had, throughout their investigation, the advantage of Mr. William Barclay Parsons' advice, not merely as chief engineer of the New York subway, but also on account of his intimate acquaintance with London conditions.

The commissioners do not contemplate, however, any very heroic resort to underground means of conveyance, the leading feature of their proposals, so far as capital outlay is concerned, consisting of two main avenues, each about four and a half miles long, running respectively east and west and north and south. It is proposed that they shall be 140 feet wide between houses and have four street car tracks over their entire length and four lines of railway beneath the surface. The acquisition of property would doubtless be a heavy item in this work, and the cost of the entire project is estimated at $120,000,000. The existence of some wide streets under present conditions is emphasized by a recommendation that a stop be put to the system, already much too prevalent, of building one-story erections, for use as sales stores, upon what would otherwise be attractive forecourts; Dickens, it may be remembered, likened the process to the pulling out of the lowest drawer in a bureau, and those who, like the great novelist, know their London, are alone able to appreciate how much of an opportunity was lost in permitting the introduction of that system.

It is proposed by the commission that a new board, of from three to five members, shall be constituted to control all traffic problems in future; as we take it, it would devolve upon the new body to decide upon the execution of the various schemes foreshadowed in the report, although, under the English system of what is wrongly called private bill legislation, a vast amount of red tape would doubtless have to be unrolled before the necessary powers could be obtained.

A Judicial View

AMONG the many valuable and interesting papers contributed to the Toledo Convention of the League of American Municipalities, it would be difficult to find one better calculated to arrest the attention of that representative gathering than that dealing with municipal finance and accounting, published on page 95 of our present issue. Its author, Mr. L. G. Powess, chief statistician of the United States Census Bureau, is eminently qualified to discuss the subject, the paper itself making it abundantly clear that he has been by no means content to allow the performance of his official duties to dwarf those larger interests whose cultivation marks the man of affairs.

The paper is so essentially self-contained that it would be a work of supererogation to devote space to any gratuitous elucidation of it at our hands, but we may be permitted to point out how well-timed an effort Mr. Powess has made in judicially discussing, at this juncture, a topic on which it is all too easy for the average man to fall by the wayside of extreme views and cults. In emphasizing, as he does, the importance of clearing the way for municipal enterprise, in America, by getting down to some reasonable and attainable uniformity in business methods, he puts his finger upon a point only too lightly ignored by many well meaning enthusiasts. More than this, he sounds a needed note of warning in the ears of those who are too prone to imagine that the last word has been said on the abnormal extension of municipal enterprise in Great Britain, making it clear, by his exposition of a novel basis for similar work nearer home, that he is familiar with both aspects of a much discussed question.

We earnestly commend Mr. Powess's paper to the study of all who may be called upon to assist in the solution of the problems, immediate and remote, with which it deals. Touching the latter category, while it is true that differences in forms of government and institutions may, and do, interpose obstacles undreamed of on "the other side," it is equally true that our own country is able to profit by foreign experience, not merely by slavishly copying its successes, but also by avoiding its mistakes.

An Important Decision

A NEW stage has been reached in a matter which has already been the occasion of a pronounced modification in American public opinion and bids fair to constitute a potential danger to peaceful conditions until such time as it is finally disposed of. The recent decision of the Venezuelan Supreme Court, confirming an earlier verdict against the New York and Bermudez Asphalt Company, leaves that body in an awkward *impasse,* with less hope of helpful intervention by the United States government than appeared possible when the former adverse award was given. For, in the meantime, a special commissioner has been appointed by President Roosevelt to report on the whole situation, and it can hardly be expected, even in view of the threats at one time indulged in, that anything in the nature of interference with, or protest against, this latest decision will be thought of until the commissioner's report has been received. In the interests of international comity it is fortunate that this is so, but it creates, none the less, a difficult situation for the Asphalt Company, which sees in it a confirmation of the decree annulling its concession and calling upon it for payment of the costs in the suit.

Meanwhile, President Castro, in whose favor a revulsion of public sentiment cannot fail to be observed, will continue to work the sequestrated deposits, using the Company's plant for this purpose. As the output is being sold to all and sundry, irrespective of personality, this proceeding can scarcely fail to exercise an influence upon the supply and price of what is yearly becoming a more important material for American road making.

If, as is possible, President Castro should take the logical step of declaring the concession forfeited, the effect would be to make these conditions permanent instead of temporary. He has already made it plain that arbitration will not be accepted in a matter over which his internal courts have full jurisdiction, and it is equally clear that the next step rests, not with him, but with the United States government; and after all that has happened there will probably be a laudable disposition to hasten slowly in that quarter. Meanwhile, the present decision adds point to the revelations made by Richard Harding Davis in "Collier's Weekly" of May 13th, extracts from which were given on page 276 of our June issue.

A New Taxation Scheme

THE desirability of encouraging the building of homes by those only moderately endowed with worldly possessions is the basis of a scheme, now receiving considerable attention in New York City, to exempt all real estate from taxation in respect of the first $3,000 of its value. Some misapprehension in regard to the proposition arose from the supposition that it aimed at relieving only properties worth that amount or less, but it has been explained that it would apply to real estate of all kinds. Of course, the relative advantage would be greater in the smaller properties. It is also explained that the proposed relief would apply to the improvements effected, irrespective of the value of the lot; thus, "if a man owns a home which is worth $3,000 apart from the lot upon which it is built, he will pay no tax upon the house at all. If another owns a house worth $20,000, irrespective of the value of the lot, he will be relieved from taxation to the extent of the $3,000; in other words, he will be taxed on improvement of $17,000, and so on all improvements, no matter what their value."

It is contemplated by the promoters that the adoption of a tax basis on these lines would stimulate the building of small homes beyond the city, and thus tend to utilize land lying ready within twenty miles, and at same time relieve New York of that congestion which is widely recognized as a blemish on the city.

The American Public and Automobiles

THE attitude of the American public towards automobile traffic, as contrasted with that prevailing in France, was recently discussed by Mr. Winthrop E. Scarritt, former president of the Automobile Club of America, who is studying this question in the course of an automobile tour in Europe. He finds, in France, a friendly and sympathetic feeling towards a new industry, and claims that Americans, if not openly hostile, are at least indifferent thereto. He complains of the difficulty of obtaining, in America, even elementary justice when disputes arise, and has a word to say as to the share of the Press in keeping this inimical sentiment alive by sensational headlines and similar methods.

Mr. Scarritt tells an old story in dilating upon the superiority of French roads; he states that in the whole United States, outside of the towns, there are only 3,000 miles of macadamized roads, as against 130,000 miles in France. Figures like these go far to explain such a feat as that performed in the interests of the New York "Herald's" special delivery service between Paris and Trouville, in which an average speed of nearly a mile a minute by automobile was maintained for a distance of 132 miles.

Smoke from Locomotives

SMOKE prevention was discussed, in our August number, in the paper by Mr. Charles H. Benjamin, M. A. Soc. M. E., superintendent of the Smoke Prevention Department of Cleveland, Ohio. Mr. Benjamin showed that, contrary to much adverse opinion, automatic stokers are capable of excellent work in practice, and, among other experiments available, referred to the introduction of brick arches and baffle walls as tending to maintain high temperatures and a proper mixing of the gases of combustion.

If we may judge from newspaper reports reaching us, the brick arch device is being tried in the fireboxes of at least one railroad entering Chicago, the shifting engines being those selected for the first stage of experiment. The results have been favorable, even under the exceptionally disadvantageous conditions involved, and if present reports be confirmed there can be little doubt as to a wide expansion of the method in question. The concentrated, if intermittent, discharge of locomotive smoke in shifting yards constitutes in some cities an aggravated phase of the smoke nuisance, and it is a hopeful sign that a beginning should have been made in that particular department of a railroad's operation.

A Scotish Municipal Gas Undertaking

THAT the advantages due to municipal ownership are not confined to the larger cities of which so much is heard is shown by a recently published letter, referring to the Scotch town of Peebles, with a population of only 6,000. The gas works were purchased from the proprietary company about five years ago, and the output of gas has since been doubled, with a reduction in price from a dollar to eighty cents per thousand cubic feet. To meet the still growing demand, new works, costing $100,000, were opened a few weeks ago, and the local authority has no apprehensions as to the financial and other results of this venture. Mainly owing to the introduction of slot meters, oil has been largely supplanted by gas, and there has been a large increase in the use of gas stoves and heaters under municipal auspices.

Civil Service Rules

A recent decision of the Appellate Court, upholding a previous decision of the Supreme Court of Illinois, gives reason for hope that a remedy may be found for the ultra-rigidity of Civil Service rules without vitiating or impairing that efficiency which is the cardinal reason for their existence. Hitherto, even those who have most at heart the desire to put an end to nepotism and graft in appointments to the public service have had perforce to acknowledge the difficulty involved in a strict interpretation of the rule making residence within the district, at and preceding the date of appointment, an essential qualification for office. It is true that, as in the state of Massachusetts, a loophole is nomically left through which to make special appointments, calling for exceptional skill and experience in given lines of work, apart from this hampering restriction, but this provision is always looked upon askance and, in the state just cited, is avowedly regarded as a thing not to be made available except under extraordinary conditions, practically not at all.

The decision now referred to makes it possible for the civil service commission of Chicago to appoint from certified lists other than legal residents of the city, and thus places the municipality on the same natural footing as private corporations in need of expert service. While welcoming this decision on grounds of general policy, we feel that satisfactory action upon the lines opened out by it is possible only in virtue of the general awakening to the need for purity in public life, and in municipal activity in particular. The existence of a healthy public sentiment on this subject

will, we are assured, do more in the long run, to bring about improved conditions in regard to public appointments than all the codes of civil service rules which, in the past, have had to take the place of that open expression of the public mind which has been found so beneficial in other directions.

♣

PRAISEWORTHY MUNICIPAL ENTERPRISE. — Something more than silent approval is called for by the public spirited action of the citizens of Baltimore in refusing to allow a calamity of almost unprecedented extent to check the execution of civic improvement works. So far from any spirit of that kind actuating the rulers of the city, they appear rather to have recognized the fact that a devastating fire brings with it, beside the immediate destruction and loss, opportunities for permanent gain, needing only the far-sighted action of those at the helm for their effective realization.

In the case of Baltimore, now that the expenditure of $10,000,000 on the long delayed sewerage project is assured, the city is committed to an extraordinary outlay of $22,350,000 in the immediate future, this including the $9,350,000 voted after last year's great fire for docks, wharves and other works of pressing necessity. We have every confidence that this expenditure will prove a profitable investment for a city which thus bids fair to earn for itself a reputation among the progressive municipalities of this country; the sewerage works, in particular, will relieve the city of the stigma hitherto attaching to it of being the largest city on this continent unprovided with a comprehensive system, and as the proposals in this connection have been the subject of an unusual amount of consideration and discussion it may well be anticipated that the works themselves will emulate in perfection the reports on this subject which have already become classics in technical literature.

♣

"A THING OF BEAUTY IS A JOY FOREVER," is as true today as when Keats penned his immortal line, and yet, how hard it has become for a utilitarian people to remember the practical application of the sentiment. The burning of the Lackawanna wharf at Hoboken has, it is true, directed renewed attention to the lack of both beauty and utility inherent to the building of timber wharves upon the waterfronts of American cities, but former experience impels us to the conviction that the agitation will be now, as in the past, only too ephemeral and unproductive.

Perhaps the most hopeful aspect of the situation is to be found in the fact that the United States government has realized the advantage, even from a pecuniary standpoint, of substituting granite and concrete masonry for the piling and sheeting once relied upon in dry-dock construction. It is possible that this consideration may exert a beneficial influence even when the unfavorable comments of foreign visitors to our shores have failed to bring home to those concerned any proper sense of their responsibilities. What makes, or ought to make, these criticisms all the more pungent is the recollection that they are not only universal but widely out of harmony with the admiration frequently expressed for other features of American engineering construction, in which we include design.

THE BUDGET SYSTEM OF MUNICIPAL FINANCE is thus referred to in a recent issue of "Pacific Municipalities.:"

This is the season of the year when a number of the cities make an examination of their financial condition with the usual result that it is reported to be "alarming;" that there is not sufficient money on hand to pay the ordinary expenses for the remaining portion of the year. When the financial stock is not taken until near the end of the year, city officials will usually find a very unsatisfactory showing. There is only one proper way of dealing with the finances of a municipality and that is at the beginning of the year to make careful estimates of the revenue and expenses for the year. After having ascertained the approximate revenue, a budget should be prepared giving in detail the various amounts to be used for different purposes during the year. There will be so much for salaries and other fixed charges, a certain sum for streets, sewers, fire department and other institutions, a definite amount for permanent improvements and lastly a certain reserve for unexpected contingencies. A little foresight indulged in at the commencement of the year and a careful oversight of the expenditures as they are made to see that they are kept within the estimates made in the budget, will almost always enable the municipality to make a commendable showing at the close of the year.

♣

THE ENFORCEMENT OF LAWS is dealt with in a lengthy article in the "Civic News," dated Grand Rapids, Mich., August 5th. While based primarily on the erratic administration of the laws bearing on automobile driving and the liquor traffic, the article is well worthy of study in regard to the wider problem. We may quote the following as an instance:

"One of the chief sources of corruption in American cities is the difference that exists between the laws in regard to liquor selling, gambling and vice on the one side, and the effective public sentiment of the communities on the other. The laws are ordinarily made by state legislatures, the majority of whose members come from rural districts or from the smaller towns and are influenced by the old-fashioned ideas of Sabbath observance and personal morality. On the other hand, the laws are enforced by mayors and police officers chosen directly or indirectly by the people of each city. Those in favor of the enforcement of the law are usually divided along partisan lines and are more or less apathetic. But the special interests which favor the non-enforcement of the law know no party and throw their strength wherever it will be most effective for them."

♣

SWEETNESS AND LIGHT have been linked by more than one English writer and thinker, but, while the light is readily apparent, we are at a loss to seek for the sweetness doubtless latent in an episode reported from Altoona, Pa. Superintendent Samuel A. Gailey of that city's municipal water department has unearthed a connection between the local gas company's plant and the city's water-works system, and alleges that an average of 75,000 gallons daily was being abstracted when the connection was discovered. An ugly complexion is put upon the matter by the statement that, at the company's request, the main supply to the works was dis-

continued seven years ago, only a tap for the office building being left. If it be true, that "since that time a connection has been made from the office line to the works, the presence of which has just now been revealed by excavations made by water department officials," no censure could be too severe for proceedings which undermine the foundations of public and private morality. We look for an explanation which will remove the impressions left by present information.

THE RESOURCES OF SPECULATION, apparently boundless as they are, almost fail to suggest a way out of a difficulty now troubling certain Indiana Solons. Anxious to find a suitable contractor for a large amount of excavating work, they are confronted with a bid, undertaking to carry it out "at one-tenth of a cent per cubic yard less than the lowest responsible bidder." The possibility of two such offers does not seem to have presented itself to the ingenuous framer of this novel proposition, and as events justified his optimism the local authority is spared any cogitations on that score. This is, perhaps, fortunate, as there will be trouble enough as it is, an injunction having been filed to prevent action on the acceptance of this extraordinary bid. Proceedings of this character, while not adding to the gaiety of nations, are not without a special value of their own in sounding the depths of human ingenuity—not to say perverseness.

MUNICIPAL HOUSING IN ENGLAND has recently received an interesting addition to the many examples which that country has to show. Sixteen cottages, erected by the Town Council of Southwold, a small borough on the east coast, built at a cost of $730 per cottage, have been opened by Alderman W. Thompson, well known as the chairman of the National Housing Reform Council, who declared them "the cheapest municipal cottages in Great Britain." Each cottage includes living room, kitchen, three bedrooms, several cupboards and excellent sanitary fittings, with about 1,200 square feet of garden land. The rental of 97 cents a week makes these dwellings self-supporting.

TO STIMULATE INTEREST in municipal affairs, the Merchants' Association of San Francisco issued an appeal, desiring that all business houses delay opening until 10 A. M. on August 10th, the date of Primary Election. It was pointed out that municipal government is business—nothing more—and that the primary election is the first step in that business. Business men, in particular, were asked to see to it that the present opportunity for reform be not thrown away. We take these notes from the monthly *Review* published by the Association, in which occasion is taken to record the gratifying fact that Mr. Charles J. Bonaparte, for thirty years the active enemy of state and city corruption, has been called by Mr. Roosevelt to a place in the Cabinet.

A New Departure

THE attention of our readers is directed to the announcement, on page 143 of this issue, in regard to the inauguration of a Weekly Supplement to the MUNICIPAL JOURNAL, in place of the Bulletin service hitherto maintained.

Editor MUNICIPAL JOURNAL AND ENGINEER:

Can you tell me of any book dealing with the subject of asphalt paving besides Tillson's, and do you know of any parties who manufacture pipes or conduits of a mixture of asphalt and sand? H. C. S.—MEXICO.

"The Modern Asphalt Pavement," by Clifford Richardson; 8vo, 580 pages, price $3. Just published.

"A Treatise on Roads and Pavements," by Ira Osborn Baker, C. E.; 8vo, 655 pages, numerous figures and tables, $5.

"City Roads and Pavements Suited to Cities of Moderate Size," W. P. Judson; 196 pages, price $2.

We will send any of these on receipt of price. We do not think that any conduit of the character described is made in the United States. If any of our readers know to the contrary, we will thank them to advise us.—EDITOR.

Personalities

—Mr. Walter A. Doane, city engineer of Meadville, Pa., has resigned.

—Mr. T. M. Mendala has been appointed city engineer of Juarez, Mexico.

—Mr. Richard T. Mannix has been appointed city civil engineer of Anderson, Ind.

—C. L. Penny, superintendent of the water-works department of Lorain, O., has resigned.

—Mr. J. A. Hunter has been appointed chief of the Bureau of Highways of Philadelphia, Pa.

—Mr. Robert McDowell has been appointed superintendent of sewers and highways at Altoona, Pa.

—Mr. Charles F. Hamilton, city engineer of Franklin, Pa., has resigned to accept a position with the State Engineering Department of Pennsylvania.

—Mr. Walter P. Moore has been appointed street commissioner of San Diego, Cal., to fill the vacancy caused by the resignation of Mr. S. W. Hackett.

—Messrs. John R. Freeman, William H. Burr and Frederick P. Stearns have been appointed consulting engineers to the Board of Water Supply of the city of New York.

—Mr. R. H. Palmer has been elected president of the British Association of Water-Works Engineers. Mr. Palmer is borough and water engineer of Hastings, England.

—Mr. William H. Ten Eyck, president of the Aqueduct Commission of New York City, has resigned and is succeeded by Mr. John E. Cowan, who was recently appointed to the commission to succeed Mr. William E. Curtis.

—Mr. James L. Tighe, city engineer of Holyoke, Mass., has sailed for Europe, where he will spend several months. In his absence Mr. Timothy J. McCarthy, assistant city engineer, will be in charge of the Engineering Department.

—Mr. James F. Hyde, city treasurer of Lincoln, Ill., took advantage of a brief vacation, spent at the home of his son, to visit the recent municipal convention at Winnipeg, Can., where he was cordially welcomed as the oldest civic official on the continent. Though in his 92d year, Mr. Hyde performs the duties of city treasurer at Lincoln, besides holding a responsible position with the local street railway company and auditing account books for three business firms.

An inveterate smoker, Mr. Hyde eats but twice a day, uses no meat, and never drinks a drop of cold water.

—Horace C. Silsbury, inventor of the steam fire engine, recently died at his home in Seneca Falls, N. Y. He came to Seneca Falls in 1836 from Connecticut, and engaged in the manufacture of edged tools with his brother and brother-in-law. In 1845 he became associated with Washburn Race in the manufacture of rotary pumps; they purchased the ground on which the immense plant of the American-La France Engine Company now stands. The rotary engine and pump was invented by Birdsall Holley, who entered the firm in 1853, and Mr. Silsbury adopted it.

THE YOUNGEST MAYOR ever presiding over the municipal destinies of Wilkesbarre, Pa., is the recipient of a large photograph of President Roosevelt, who spent much time with him on the occasion of the recent visit to the mining districts. Mayor Kirkendall was then celebrating the thirty-third anniversary of his birth, and the present gift follows up the President's promise to mark the date. The two men appear to have got on very well together, President Roosevelt particularly applanding the mayor's action in having, as a Democrat succeeding a Republican, made but two changes in 150 offices.

Convention Dates

September

—American Society of Municipal Improvements, Montreal, Can., September 5-7. George W. Tillson, secretary, Municipal Building, Brooklyn, N. Y.

—New England Water-Works Association, New York, N. Y., September 13-16. William Kent, secretary, Narragansett Pier, R. I.

October

—American Civic Association, Cleveland, O., October 4-6. Clinton Rogers Woodruff, secretary, 121 South Broad street, Philadelphia, Pa.

December

—American Economic Association, Baltimore, Md., December 26-30. Frank A. Fetter, Morril Hall, Ithaca, N. Y.

Fire and Police Personals

—Frank Reid has been elected chief of the fire department at Averyville, Ill.

—James M. Murphy, chief of the fire department of Lapeer, Mich., died recently.

—G. A. Willis has been elected chief of the fire department of West Grove, N. J.

—John Campion has been re-appointed chief of the fire department of Chicago, Ill.

—J. W. O'Connor has been elected chief of the fire department of Huntsville, Va.

—Walter E. Price has been re-elected chief of the fire department of Champaign, Ill.

—C. R. Ferguson has been elected chief of the fire department of Whitney's Point, N. Y.

—Mr. Otto H. Krause has been elected chief of the fire department of Hackensack, N. J.

—Charles E. Burr has been re-elected chief of the fire department of Bordentown, N. J.

—David Moore has been elected chief of the newly organized fire department of Ocean City, N. J.

—Francis O'Neill, chief of the police department of Chicago, Ill., has written his letter of resignation.

—J. Edward Schmitz has been re-elected chief of the fire department of Denton, Tex., for the fifth consecutive term.

—J. Thad Mullin, chief of the fire department of Birmingham, Ala., has resigned and will be succeeded by William P. Walton.

—It is reported that George L. Smith, chief of police of Allentown, Pa., has been dismissed by Mayor Alfred J. Yost for accepting hush money.

—Edward O. Goodwin, for ten years chief of the fire department of East Hartford, Conn., has declined to be re-elected and is succeeded by Edward Bragg.

—Edward O'Donnell has been appointed chief of the newly organized paid fire department of Cranford, N. J.

—William H. Thies has been elected chief of the fire department of Laurel, Md.

—Ashley A. Dunham has been appointed chief of the fire department of Waterloo, Ia. The department is a paid one and Chief Dunham was chief of the old volunteer department for many years.

—George E. Hines, chief of the fire department of San Jose, Cal., died of heart failure recently at the home of his son in Lodi, Cal. Chief Hines was fifty-two years of age and entered the department as tillerman of the hook and ladder on January 1, 1896. On September 15, 1904, the Board of Police and Fire Commissioners unanimously appointed him chief of the department to succeed Richard Brown.

A Veteran in Garbage Disposal

COL. W. F. MORSE, consulting sanitary engineer, 17 Battery Place, New York City, has for many years been engaged in the work of waste disposal in this country. As general manager of the Engle Sanitary & Cremation Company, of Des Moines, Ia., he re-designed the Engle Crematory, which was subsequently built in upwards of fifty places, notably at the Columbian Exposition, Chicago, in 1893, where it was awarded two grand prizes.

He afterwards designed and installed the steam and formaldehyde disinfection plant in New York City, this being the largest station of its class in this country. His surveys, design and superintendence were accepted for the refuse utilization station in Boston, Mass., which has been in successful operation for the last seven years. His plans were accepted by the government for the large garbage and refuse destructor at Manila, P. I., and for many military and naval stations, hospitals and sanatoria.

Col. Morse has designed a large number of refuse destructors erected in hospitals, public institutions, department stores and other business establishments, hotels and dwellings.

His survey, reports and design for a refuse utilization station were accepted by the city of Buffalo, N. Y., and the plant is now furnishing auxiliary power for the operation of the adjacent municipal sewage pumping station.

The plans presented by him for the installation of a mod-

ern refuse destructor, for developing steam power to be used in conjunction with the electric light station at Westmount, Montreal, P. Q., have been accepted, and the plant is now under construction.

MUNICIPAL AMENITIES.—The Providence *"Journal"*, referring to the intended retirement of Mayor Ashley, who has been at the head of municipal affairs in New Bedford for eleven years, remarks that if this determination is adhered to a considerable minority of New Bedford citizens will be deprived of the annual pleasure of abusing and threatening to defeat him.

The Toronto City Council—How Constituted

UNDER the above caption, Alderman S. Alfred Jones, LL. B., Toronto, contributes to the August Bulletin of the League of American Municipalities an article describing the present form of civic government in that Canadian city, from which the following notes are compiled.

The governing body is made up of the mayor, who acts as chairman of the board of control, four controllers, and eighteen aldermen, twenty-three in all. The mayor and the four controllers are elected by the city as a whole, irrespective of ward limits. Until this year, the cumulative system of voting applied to election for controllers, *i. e.*, the elector could give more than one of his four votes to an individual candidate. The eighteen aldermen are elected by wards, three from each of six; the elections are held on each New Year's day, the term of office being one year.

There are six standing committees of the council, dealing respectively with works, property, fire and light, legislation, parks and exhibition, the sixth being the "island committee." It seems important to note that "the board of control exercises the threefold function of being (1) practically a committee of council having distinctive duties to perform, subject to council's approval; (2) having in certain cases power of final action, reporting such action merely for the information of council; and (3) having vested in itself the power and obligation to pass upon the report of every committee, before such report can be considered in council."

The result of this system is that no report of a committee, as such, comes before the council, the report of the board of control taking the place of this procedure.

The extent of the powers enjoyed by the board of control is shown by the fact that the council cannot, except by a two-thirds vote, vary any recommendation of the board of control in the direction of increasing the cost of any work; reinstate a head of department after action by the board of control; or make any permanent appointment without previous favorable recommendation by the board. These conditions tend to show the wisdom of the provision that every member of the board must have served a two year's apprenticeship in the council. Broadly stated, the Toronto system makes the council the legislative body and the board of control the executive; it lessens the work of committees and adds greatly to that of the board of control, as is shown by the former meeting, as a rule, twice a month, while the board meets from two to five times a week. The board is, in fact, a commission, responsible to the electors at their annual sederunt on New Year's day.

Alderman Jones concludes his article by stating that Toronto's system is as yet largely in the experimental stage. We join with him in the belief that its evolution will be of keen interest to the student of municipal governing.

Los Angeles Fire Department

THE fire department of Los Angeles, Cal., is manned by 200 men and the apparatus is drawn by 117 horses. The apparatus and equipment are as follows: First size Metropolitan steam fire engines, two; third size Metropolitan, one; second size La France, two; second size Amoskeag, four; second size Ahrens, three; third size Ahrens, one; second size Nott, four; three third size Metropolitan engines have been ordered, making twenty in all. There are six combination wagons of the Seagrave pattern, each with two sixty-gallon tanks and each capable of carrying 1,000 feet of two and one-half inch hose; two Champion chemical engines, each with two fifty-gallon tanks, and eleven other combination chemical and hose wagons; one hose carriage, two hose wagons and four hose carts; one eighty-five foot Babcock aerial hook and ladder truck, one quick raising, roller-bearing Seagrave aerial truck with double the regular amount of equipment and with Firestone side-wire tires; one Seagrave and one Babcock city service hook and ladder truck; one sixty-five foot water-tower, Gorter pattern, raised by a water motor; three chief's buggies and three supply wagons. There are on hand 47,700 feet of two and one-half and 500 feet of three and one-half inch hose and 1,000 feet of one-inch chemical hose; ten Siamese connections, thirty-six Gorter shut-off nozzles and twenty-two chemical extinguishers. There are nineteen engine houses, three hose houses and one chemical engine house.

During 1904 the department responded to 818 alarms, of which ninety-one were false. There were 384 box alarms, 111 telephone and box, 276 telephone and forty-seven stills. The main causes were: Bonfires, brush, rubbish, etc., 152; gasoline stoves, seventy-one; coal oil lamps, thirty-three; gasoline explosions, twenty; defective flues, twenty; chimney fires, eighteen; crossed wires, seventeen, and gas stoves, fifteen. In the class of alarms residences lead with 234; lodging houses, sixty; barns and stables, thirty-eight; sheds, fences, etc., thirty-two; restaurants and office buildings, nineteen each, and hotels, fifteen. Regarding the construction of the buildings in which fires occurred, wood led with 412; brick followed with 138 and adobe with two. The number of fires confined to one building were 538 and those which spread, fourteen. The total loss for the year was $527,545.

The department raised 2,402 feet of ladders, used 297,500 feet of hose and 12,781 gallons of chemicals. In 229 cases the fires were extinguished by the occupants; in sixty-three, by buckets of water; in 176, by water from engines; in 134, by chemicals; in sixty-nine, by water and chemicals; in forty-six, by garden hose, and in ten the fire was smothered. There are 229 fire alarm boxes in use, being spaced at two-block intervals in the business section and at four-block intervals in the residence section.

The cost of maintenance was $192,496, and the amount expended for new engines, houses and lots, and remodeling was $56,114; total, $248,610.

Street Work at Ottawa

Ottawa, the capital of Canada, has an area of 3,365 acres and a population of over 63,000. The length of streets exceeds 100 miles, of which six and one-half are paved with asphalt and one mile with tar macadam; there are over 100 miles of granolithic sidewalks. The area of the public parks is about 237 acres. The value of taxable property is almost eleven millions, not including that owned by the city, valued at nearly three millions of dollars.

The total amount expended during 1904 for street improvements was $273,560. There was laid during the year, 4,150 linear feet of Trinidad Pitch Lake Asphalt pavement, which the city engineer, Mr. Newton T. Ker, refers to as the "standard pavement for roadways occupied by street railway tracks." This paving cost, including all charges and interest, $84,998.

During the year, 1877 new street signs were erected, of which 1,262 were on the main thoroughfares and 615 on the less important streets. The signs used on the thoroughfares have square block aluminum letters, three inches in height, riveted to a strip of black japanned tin three and one-half inches in width. The cost of the signs averaged five cents a letter. On the less important streets the signs were of tin, painted white, with black letters.

Snow was cleared from over 127 miles of walks, at an average cost per mile of $117, or a total cost of $14,925 for cleaning alone, or $129 per mile, with a total of over $16,000, if the repairs to plant, etc., are added. The equipment for this work is as follows: thirty-five double sidewalk plows, seven single sidewalk plows, ten walkaway plows, one light road grader, four ice cutters and levelers, two large snow (street) rollers, one sidewalk roller or roughener and ten dozen snow shovels.

Regarding the tar macadam pavements laid, assistant city engineer R. H. Parsons reports, in part, as follows: "The tar macadam pavements laid during 1902 and 1903 have proven very satisfactory and the prospects are that a large amount of this class of pavement will be laid during 1905. The total yardage laid during 1904 was 11,043, and the average cost, exclusive of the Albert street pavement, was $1.327 per square yard. * * * * This tar macadam pavement on Albert street was of rather novel construction. This pavement was laid from the end of the asphalt pavement, at the beginning of a grade of about 6 per cent., down this grade to Commissioner street. It was thought that the rather rough surface of the tar macadam would furnish a much better foothold for horses on this hill than an asphalt pavement * * * * A steam concrete mixer was purchased during the year and was used for mixing the tar and two-inch limestone. This proved to be a very quick and thorough way of mixing. The mixer was located near the stone heaters and the stone brought to it from the heaters either by means of an overhead track and bucket or by wheelbarrows and an inclined platform. The latter method proved the best. As soon as the heated stone was dumped into the running mixer, the hot mixture of tar and pitch was poured over it and the mixing began. The tarred stone was discharged from the machine directly into the carts which hauled it onto the street. The tar and pitch heaters were located conveniently on the side of the mixer opposite to the stone heaters. This machine would mix the tar and stone faster than we could supply the stone to it."

♣

A Move at Ottawa

Under this caption, our London namesake publishes, in its issue of August 11th, an article based upon a letter from an Ottawa correspondent, also believes that "there are live municipal questions in the great and growing Dominion of Canada that will interest our people at home who are engaged in similar developments." Among municipalities moving in the matter of acquiring the electricity supply and other public utilities, Ottawa is singled out for more detailed reference. That city "has just secured, after a long Parliamentary struggle, a local electricity enterprise with which to meet the proposed doubling of charges by the original company. The situation is an interesting and a curious one. The purchase by the city of the Consumers' Electricity Company has been followed by an appeal to the Courts by the Ottawa Electric Company. The Consumers' Electric Company was established to compete with the Ottawa Company, and it leases its power from the Ottawa and Hull Power and Manufacturing Company. The Ottawa Company claims that the city has no right under any existing law to acquire power or supply light, and has applied for an injunction to restrain the expenditure of money in this connection, and for a decision that the by-laws under which the city has taken over the Consumers' Company are invalid, and the whole proceedings unauthorized by the laws of either the Province or the Dominion. The mayor, who is a lawyer himself, a remarkably astute one, says the only thing that can happen, even if the Ottawa Company succeeds in its contentions, will be to compel the city to buy it out by arbitration. The city did once make an attempt to buy out the Ottawa Company, but was met in a manner that left it no other alternative than to look out for its own interests without further regard for those of others. The Ottawa Company has received fair warning that the city is going to fight this case on its merits, and its managers must decide for themselves how much consideration will be coming from the new owners of the Consumers' plant if the former fails to force the city's hand."

♣

Street Improvements—The Incidence of Cost

Apart from our personal concern in, and recognition of, the appreciation expressed by the editor of the "Newburg, (N. Y.) News," there is matter of widespread interest in the remarks contained in a recent letter from that gentleman, reproduced in part as follows:

"We have received a copy of the current Municipal Journal and Engineer and have noted its contents with interest; the publication will be of much value to us.

"The 'News' has been working hard for municipal progress in various lines, particularly better streets, but so far not with the success desired. Newburgh (25,000 population) has less than three miles of improved streets. Seven years ago, a board of public works was created to further public improvements, but in the public works amendment to the charter a provision crept in permitting the board to improve streets at the sole cost of the city at large. You can probably

guess what effect this has had; so far as our information extends, it is practically a financial impossibility to make any headway in street paving without assessing a fair portion of the cost upon benefited property.

"Recently, the improvement of Lander street, a purely residential thoroughfare containing about 8,000 square yards, and through which operates a branch of the trolley system, has been proposed, at the cost of the general taxpayers. Bids were to have been opened and the contract for paving awarded by the board of public works last week, when an injunction was obtained by the trolley company, which questions the legality of paving under the city-pay-it-all plan. In the same chapter of the city charter permitting the board of public works to pave at the cost of the city at large there is another provision in direct conflict, directing that not exceeding one-third of the cost of street paving shall be paid by the city. The traction company claims that the latter provision should be followed. Before the board of public works was created, this provision was in the charter and the common council paved three streets under it.

"The object of the traction company in these proceedings is to be relieved of threatened double taxation, as it claims. Under the plan of the city paying all the cost of paving the street, the street railway, in addition to paying for paving that portion of the street occupied by its tracks, as required by the state railroad law, would also have to pay a considerable portion of the expense of the improvement as a whole, as one of the chief general taxpayers of the city."

A German Example of Municipalization

ACCORDING to the "Electrical World and Engineer," Glasgow will have to look to her laurels as the foremost example of municipal activity. The following list is given by our contemporary of matters under the direct control of the city authorities in Freiburg, Germany:

1. Four hundred cottages, each with a little garden. Over $370,000 has been spent by the city to give the poorer citizens better homes.

2. Electric street cars. The fare to any part of the city is 2½ cents.

3. Fifty advertising boards. All outdoor advertising is controlled by the city. The rate is 10 cents a day per square foot.

4. Pawnshops. The city owns all the pawnshops and charges a low rate of interest. It does not try to make any profit, but runs the pawnshops at cost.

5. Savings bank. The city owns the only savings bank in Freiburg. It has over $5,000,000 in deposits.

6. Theater. The principal theater at Freiburg is owned by the city. The citizens regard the theater as part of their educational system.

7. Restaurant. There are public restaurants in Freiburg which serve breakfasts and suppers for 5 cents and dinners for 6½ cents. The citizen can get a good cup of coffee and two thick slices of bread for 2½ cents.

8. Burial of the dead. The city has taken over the undertaking business. The cost of a funeral in Freiburg runs from $5 to $32.

9. Farms and forests. The city has bought large tracts of land near the city, so that work may be given to any workmen who need open-air jobs for their health.

10. Correct time. A $5,000 electric clock has been placed in the City Hall. This clock connects with eighty-five other clocks in different parts of the city.

11. Electric light. The city manufactures all its own electricity, both for light and power.

12. Architects. Freiburg pays a salary to the best architect in the city as a kind of building department.

The Facts about Municipal Ownership

"BRADSTREET'S," in its issue of August 19th, notes the fact that, in response to a demand for information on the subject of municipal ownership and operation of public utilities, the executive council of the National Civic Federation has appointed a committee to investigate and report upon the general subjects, and proceeds to comment thereon as follows: "It is suggested by the council that the present debate upon the matter is often misleading because of contradictory or unsatisfactory statements of fact, and it is intended that the investigation proposed shall disclose the actual results of public ownership and operation as far as they have been undertaken in the United States, and of their more extensive practice in foreign countries. The inquiry proposed will cover in its scope the relative advantages of public ownership and operation as compared with public ownership and private operation and private ownership and operation. Each system will be examined with regard to its effect upon wages, hours and conditions of labor; collective bargaining; the cost and character of service; political conditions; civil-service regulations; the spoils system; possible municipal corruption; the spoils system and taxation. The executive council of the Civic Federation has an eye for the needs of the time, and it is safe to say that no such illuminative report has ever before been presented on the subject of municipal ownership as that which will be laid before the public by the National Civic Federation committee."

THE FIRE DEPARTMENT OF BIRMINGHAM, ALA., responded to 501 alarms last year, of which 400 were transmitted by telephone, forty-five by box and fifty-six were still. Of the buildings in which the fires originated, 313 were frame, ninety-three brick or stone and ninety-five other than these named. Among the causes were: Sparks, 146; carelessness, thirty-three; adjoining buildings, thirty-two; lamp explosions, twenty-one; incendiary, seventeen, and defective flues, eleven. Seventy-seven were false alarms. The total value of the buildings at risk was $2,204,462.27; of the contents, $2,031,298.68. The insurance on the buildings was $1,267,720, and on the contents, $1,531,975. The loss on the buildings was $148,718.96 and on the contents, $202,286.89. The total expenses for the maintenance of the department was $77,198.55. The manual force of the department is composed of sixty-two men. There are twenty-seven horses; two first size Metropolitan, one second size and two third size Ahrens engines; one sixty-five foot aerial truck; six first class two-horse hose wagons; one twin-tank chemical engine, each tank having a capacity of sixty gallons; one supply wagon; one one-horse hose wagon; one chief's buggy and about 14,000 feet of hose.

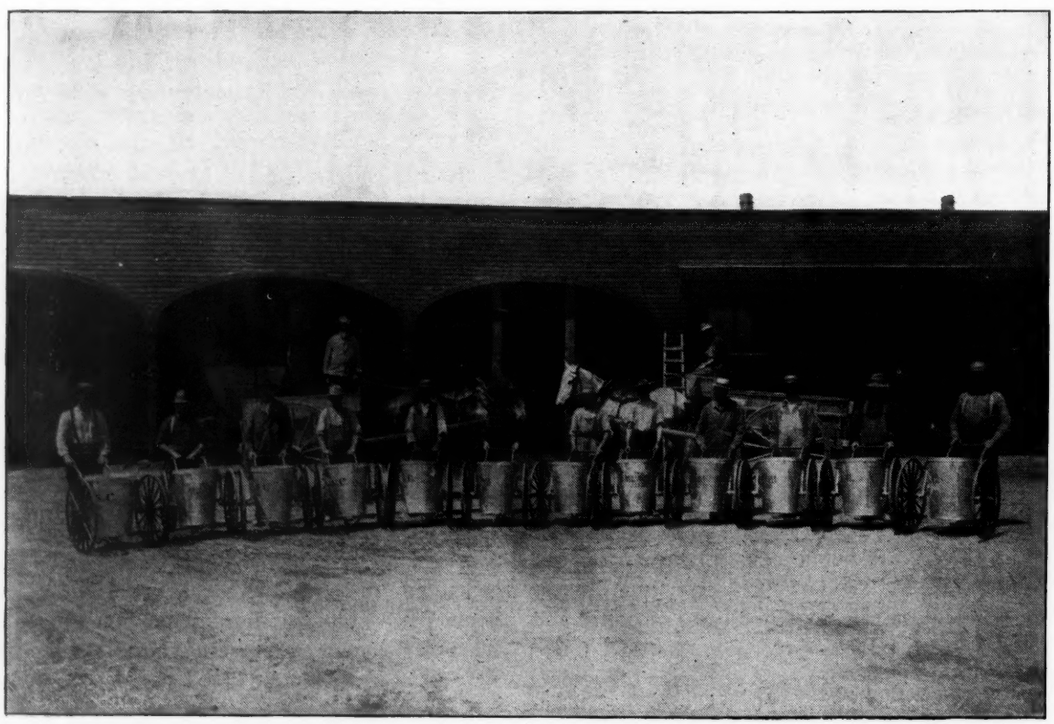
INCIDENTAL ITEMS OF INTEREST

Many Matters of Moment to Municipalities Briefly Told—Short Record of Happenings and Facts in City, Town and Village

THE REPORT OF THE SUPERINTENDENT OF STREETS OF CAMBRIDGE, MASS., FOR 1904.—Cambridge inaugurated the can carrier system of street cleaning last year. Twelve carriers were purchased and each carrier was allowed six cans. As fast as a can was filled it was placed on the curbstone and another substituted. The filled cans were emptied into the dump wagon, which made several trips a day to the different sections. The cost of cleaning the streets was $30,999.43, and the amount will probably be increased in order to cover several sections not included in last year's work. The cost of ash collection was $32,096.98, which was larger than that for any former year, due to the severity of the winter, which increased the amount of fuel consumed and hindered the work of collection. The superintendent recommends the purchase of a stone ledge in order that the city may supply its own crushed stone and macadam, thus securing a uniform surfacing material. The value of the real estate and buildings of the department is $136,000 and the personal property $62,353.33, giving a total of $198,353.33. The latter property includes fifty-one watering carts, seventy-two horses, forty-eight single and double carts, four steam rollers, one two-horse section roller, two stone crushing plants, eight ash carts, road machines, pick-up sweepers, scrapers, etc. For rebuilding streets there was expended $55,478.40; for snow removal, $17,999.07, and for street watering, $28,000.

FILTHY STREETS BREED DISEASE. Owing to political differences between the Board of Supervisors and the Board of Public Works, the sweeping of the streets in San Francisco has been badly done for several weeks at the beginning of the present fiscal year. Not only have the merchants and citizens generally been complaining of dirty streets, but Health Officer D. F. Ragan has sought to have the conditions remedied because, he asserts, the accumulated filth has greatly increased disease. In a recent communication to the various departments and officials concerned, he said: "Owing to the rapid changes of temperature, many cases of sore throat have developed, and coughing and expectorating are quite common in the public streets. Many of the physicians are reporting the frequent occurrence of swelling of the glands of the neck, indicating an infection through the nose and throat, which in all probability owes its origin to dust infection."

As the friction between the departments is now somewhat lessened, the street cleaning is proceeding more systematically and the conditions are materially improved.



PATROL CART FORCE—CAMBRIDGE, MASS.

THE TOTAL RECEIPTS OF THE WATER DEPARTMENT OF HARRISBURG, PA., for 1904 were $126,021.37, an increase over the preceeding year of $2,767.71. The average time run per day was nineteen hours and twenty-nine minutes. The total pumpage, corrected for slip, was 3,216,114,405 gallons, a daily average of 8,787,198 gallons. For manufacturing, elevator and motor purposes there was furnished through meters 1,602,614,000 gallons for the year, a daily average of 4,378,727 gallons. Allowing 500,000 gallons per day for street washing and for the above services which are not metered, the daily consumption of water other than for domestic purposes was 4,878,727 gallons. The population supplied is estimated at 65,000 and the daily per capita consumption was 135 gallons, of which 60 gallons were for domestic purposes. The ordinary expenses of maintenance was $28,740.94 and $9,784.22 was expended out of the regular appropriations for betterment and repairs, a total of $38,667.23 for the ordinary operations of the department. Additional work increased the expenses to $52,-192.39 and leaves a balance of $73,828.98 for the payment of the appropriations for interest, state tax, the sinking and general funds. The net earnings were $38,192.98. The time run by the three engines was 7,122 hours and fifty-one minutes. Of the 5,461 tons of coal used, 235.68 tons were used for banking fires. The cost of the coal consumed for the year was $8,191.51. The cost of coal for pumping 1,000,000 gallons to a height of 235 feet was $2.30. There are in the city now 691 hydrants, of which nineteen were added last year. The department has in service 5,954 meters, of which 359 were installed in 1904. There are 8,-359 taps metered, or 64 per cent. of the whole number supplied. The water mains added last year, 16,717 feet, make the total length of the system fifty-one miles and 2,460 feet.

A MOVING ROADWAY, 1,500 long, is the essence of a proposal before the Kansas City council, which is asked to grant a thirty-years' franchise for converting the old Ninth street incline, formerly used for cable car traction, into two steel wagon tracks, the motive power being furnished by an endless steel hauling cable, one inch in diameter, actuated by electric power supplied by the Metropolitan Street Railway Company. Under existing conditions, nearly five thousand wagons are daily hauled by horse power up this steep hill. The contrivances by which the cable will be worked are covered by patents held by Colonel I. A. Sweat of Cincinnati, O.

THE GARBAGE SERVICE AT CHATTANOOGA, TENN., has given rise to allegations by Mr. Harry Van Dusen, a commissioner on the board of public works, who claims that the contract for this branch of the city's work is a dead letter. Among other items enumerated, it is stated that the covering of the wagons, designed to prevent the scattering of dust and refuse on the streets and to conceal the contents from observation, has not been carried out by the contractor. Complaint is also made of the low rate of wages paid to the contractor's employees, and specific instances of unreasonable delay in the collection and disposal of garbage are given.

A WOMAN CITY CLERK.—It is reported that the distinction of being the only woman city clerk in the state of Iowa belongs to Miss Estella Gordon, of Centerville. The interesting question of the legality of her election by the City Council, the statute saying the office shall be filled by a qualified elector, brought about much interesting discussion. The city attorney, however, rendered an opinion that Miss Gordon was a qualified elector, as she was qualified to vote in Iowa at certain school and municipal elections where the question of bonds is voted on. There can be no question as to the progressiveness of certain of the Middle Western states where women are elected to municipal offices hitherto held exclusively by men.

PORTLAND, ORE., HAS 260.61 MILES OF STREETS, of which 91.03 miles are unpaved. Gravel roadways lead with 69.90 miles; macadam pavement is second with 58.13 miles; plank roadway, 18.67 miles; elevated roadway, 7.77 miles; stone block, 5.11 miles; asphalt, 4.94 miles; wood block, 2.13 miles; bituminous macadam, 2.06 miles; brick, .81 miles, and steel bridge, .60 miles. The total mileage of sidewalks in place is 482.97 miles, of which 328.16 miles are of wood, the balance of 154.81 miles including cement, stone, brick, gravel and asphalt. Of the 133.02 miles of sewers, 70,297 feet were laid last year, an amount only exceeded by two former years, 1892 and 1903.

A WATER-WORKS DISPUTE.—Something like a deadlock exists between the city authorities and the water-works company at Chester, Pa., owing to a dispute as to the interpretation of an agreement in regard to hydrant rental. The city maintains that the annual rental of $40 for each fire hydrant entitles the city to the use, once a fortnight, of each plug for street gutter flushing, this work to be performed by the company. This work not having been done, the city desires a reduction of the company's bill, while the company, on the other hand, see in the stipulated use of hydrants only a privilege extended to the city, and not a requirement as affecting the company. It seems probable that the matter may be threshed out in the courts.

LORAIN, O., LAID 18,570 FEET OF IRON WATER MAINS IN 1904, making forty-one miles, 1,259 feetof water pipe in use, of which four miles 2,042 feet are wooden. Of the 936 water meters now in use, 179 were set last year. The receipts from the metered services were $25,367.90, and the receipts from the flat-rate services were $21,042.47, showing a percentage in favor of the meters, as there were 3,896 flat-rate services. The total pumpage for the year was 2,296,-872,318 gallons for three pumps, one of which was used for only twenty-eight days. The daily average pumpage for the two regularly working pumps was 6,146,475 gallons, and for the auxilary pump, 1,997,551 gallons. The coal consumed during the year was 4,065,500 pounds, or an average of five tons every twenty-four hours. The total receipts of the department were $99,212.03.

ANNISTON, ALA., WAS WITHOUT A POLICE FORCE RECENTLY FOR TEN MINUTES. With the exception of the chief of the department the entire force resigned in order to carry through a measure raising their salaries fom $50 to $60 per month. The city charter provides that no officer's salary shall be raised during his term of office, and in order to get around this provision of the charter the resignations of the policemen were accepted, an ordinance passed amending the ordinance fixing city officers' salaries, and all the policemen re-elected, so that the charter was not violated.

THE CONSUMPTION OF WATER in the large metropolitan area of which Boston, Mass., is a principal factor, still maintains a high level, notwithstanding the efforts being made to bring it down to a more reasonable figure. According to the report, just issued, of the Metropolitan Water and Sewerage Board for 1904, the daily average quantity of water consumed within the board's district during the year was 114,876,000 gallons, equal to 123.8 gallons per inhabitant. The increase of nearly eight million gallons per day in the consumption, as compared with the previous year, is largely attributable to the lavish use of water to prevent freezing of pipes during the unusually cold weather in four months of the year.

As Venturi meters have been fixed on the mains supplying each separate area, it is anticipated that the constant check thus rendered possible will have the effect of reducing the consumption. Next year, however, a potent element will come into play in the changed method of assessment for water, as the contributions to the Water Board finances will thenceforward be based, in part, upon the volume of water delivered to each separate municipality.

WATER-WORKS FIGURES OF BALTIMORE, MD.—The total consumption of water in Baltimore for 1904 was 25,527,863,859 gallons, of which 4,912,217,324 gallons passed through meters. The average consumption per day was 64,283,781 gallons, of which 13,421,358 gallons represents the daily average metered supply. The per capita per day consumption was 118 gallons. The duration of the fire gave the water system a severe test, the excess consumption for two days being about 106,000,000 gallons, or over 80 per cent. above the normal consumption, and for the week of the fire the total excess consumption was about 170,000,000 gallons, or about 40 per cent. above the normal. The distribution system was handled in such a manner that there was failure in the supply. There has been laid in the last year about 53,300 feet of new mains, ranging in diameter from four to sixteen inches. 1,700 new service connections were made and ninety hydrants were set up, including thirty double-steamer nozzle hydrants.

WATER FILTRATION AT WASHINGTON.—The first two beds, out of a total of twenty-nine filters, designed for the purification of the capital's water supply, were inaugurated on August 15. These represent a capacity of 6,000,000 gallons per day, and it is expected that the entire plant will be in operation in October. The total expenditure is placed at $4,500,000.

MOUNTED POLICE FOR SEATTLE.—Mayor Ballinger, of Seattle, Wash., will insist on having mounted policemen to patrol the outlying sections of the city. In his last message to the city council he recommended that steps be taken towards this end, but the council took no action on the matter. Now the mayor believes that the matter should be pushed, as it has assumed serious proportions. In his new recommendations he will point out the advisability of appointing at least twenty men and of erecting one substation, with the idea of making several precincts later, each with its own station. At present, however, the size of the force does not warrant such action and he will only insist on the mounted force and one station.

MUNICIPAL STREET CARS IN GLASGOW and their profits formed the subject of some remarks, by a member, at a recent meeting of the tramways committee of that city. In 1894, when the street car lines were taken over by the city, the undertaking paid $12,100 as its contribution towards the taxation of the city; in 1904-05 this amount had increased to $186,600. Contributions out of profits, to the city's "common good fund" have increased, in the same period, from $43,800 to $122,000 per annum, and a total of $764,000 has been paid into the fund.

MUNICIPAL CONSTRUCTION IN COLUMBUS.—Owing to the changes and improvements necessary to secure an improved water supply system and a satisfactory method of sewage disposal, the city of Columbus, O., is at present the scene of very considerable activity in the line of public contract work.

In connection with the water supply system, the dam across the Scioto river, now well under way, is 1,000 feet in length by 70 feet in height from the foundation to crest. This dam will raise the water 30 feet and there will be a 500-foot overflow weir in the center. This piece of work will be completed this season, at a cost of about $600,000, Jas. Westwater being the contractor. The water purification works will cover an area of ten acres, with a capacity of 30,000,000 gallons, this work having been let to Westwater & Casey at $524,000.

The cost of the sewage disposal system was placed by the city council at $1,200,000, of which work representing a total of $900,000 is already under contract. The disposal plant is to be 1¼ miles beyond the sewage pumping station, and the disposal area is 250 acres in extent. Investition works will cover an area of ten acres, with a capacity still being carried on at the testing station authorized by the city council, and several other contracts have been let in connection with the system.

MUNICIPAL MOTOR CARS have been adopted by the city council of Leeds, England, for the use of its servants and members of committees engaged in carrying out public duties. It is anticipated that the new cars will bring about a considerable economy as compared with the present charges for carriage hire. As showing how far municipal accounting can be carried, it may be noted that the several committees using the cars will pay their quota to the new department which is to have control of the vehicles.

A Model Gas Franchise for Indianapolis

THE city of Indianapolis has granted a franchise for the organization of a popular gas company which it is believed will prove to be a model form of contract for a public service corporation, a number of important provisions having been adopted from the English system of company control. The franchise places the maximum price of the gas at sixty cents a thousand cubic feet; as the gas is primarily intended for fuel purposes, it must possess a calorific quality of 600 British thermal units.

The grantees named in the franchise are three leading citizens, two being presidents of the Commercial Club and Board of Trade respectively, and these chose for the third member a well known public-spirited citizen. They are to incorporate a company having at least $1,000,000 capital stock, divided in shares of $25 each, so that practically every consumer can find it within his means to invest. Increases in the capital stock must be sold to the highest bidder, at public auction to be advertised in advance. Any premium obtained for the stock must be turned into the surplus fund. This provision is intended to guard against over-capitalization, the bane of the gas industry, and is a precaution borrowed from England, where its efficacy has long been recognized. Investors are given certificates for the face value of their subscriptions, bearing interest at ten per cent. per annum, payable half-yearly. Interest will be cumulative, i. e., it will accrue should there be inability to pay during any half-year. The stock will be held by five trustees and voted by them, this provision being designed to prevent manipulation. The board of trustees is to be self-perpetuating. The city will have a voice in the management of the gas company's affairs, the mayor being given the power to name one of the five trustees. The others are named by the two commercial bodies of the city.

The trustees will elect nine directors annually, to have charge of the business management. The franchise provides for the removal of any trustee or director found to have any interest in any competing gas company. The plant is ultimately intended to become the property of the city. When the stockholders have been recouped the face value of their investment, together with ten per cent. interest, their certificates are to be cancelled, and all right and title is to be conveyed to the city, which will then be authorized to operate or lease the plant. At that time the price of gas is to be reduced as near to actual cost as operating expenses will permit.

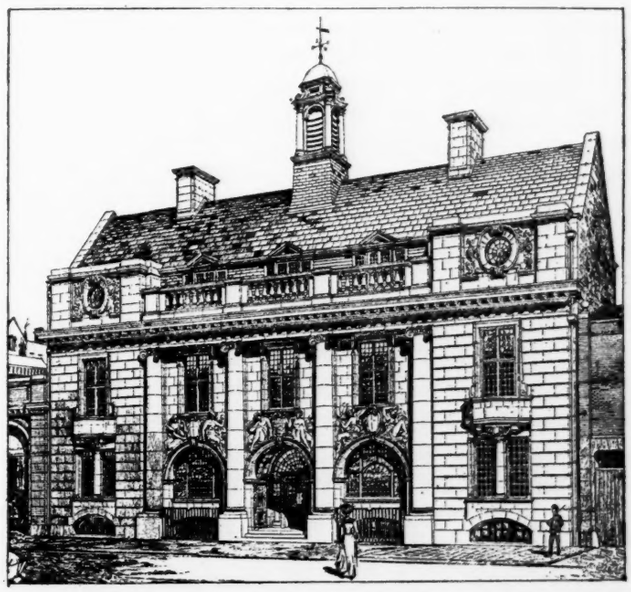
In guarding the rights of the public, the franchise provides for ample publicity by requiring detailed semi-annual reports of the company's operations to be printed in at least two daily newspapers. The right to examine the books at all times is reserved to the city controller, and the city engineer is similarly given authority to investigate the physical condition of the plant. The board of public works will supervise the tests made to determine the quality of the gas furnished.

Provision is made in the franchise for applying the earnings in the following order: First, to payment of matured debts and operating expenses; second, to the payment, semi-annually, of dividends and any unpaid interest; third, to making betterments and extensions ordered by the board of public works; fourth, to the repayment of stock subscriptions in whole or in part.

If the earnings will not permit of extensions to plant, these can be obtained, on petition from persons to be served, by the sale of sufficient stock to cover the cost of the improvement. The sale will be made at auction, and the petitioners must bind themselves to bid at least par value for the stock. The plant is to be in readiness within one year from the date of approval of the contract by the city council, with which body it reposes, and the company must then have 100 miles of mains in the ground. No bond is required of the citizens who are to organize the company, although the city reserves the right at any time to demand one on giving thirty days' notice.

The period proposed for the franchise is twenty-five years. If, at the expiration of that time, stockholders have not been paid out, the city reserves the right to have the plant mortgaged and to take up the unredeemed stock, so as to acquire the plant. Should the concern become insolvent, a similar provision is made, whereby the city can take over the plant by paying the debts. Should an attempt be made to charge more than sixty cents per thousand for the gas, the rights and privileges of the franchise will lapse and the plant will revert to the city as a penalty. These precautions have been taken to guard against a repetition of the city's experience with the Consumers' Gas Trust Company, which, founded as a semi-popular corporation to which all sorts of favors were granted, has been wrecked and diverted from its original purpose. In this respect, again, it will be seen that the city has taken experience for its guide, adding largely to the value of the experiment for other municipalities.

Since the granting of this model franchise the city has withdrawn its offer to grant a fuel gas franchise to the highest bidder, on terms outlined in the August issue of the MUNICIPAL JOURNAL.



NEW TOWN HALL, RECENTLY OPENED AT CREWE, THE WELL-KNOWN ENGLISH RAILROAD CENTER *

*"The Municipal Journal," London.

Illuminating Gas from Crude Oil

REPORTS from Hartford City, Ind., partially confirmed, are to the effect that gas is being manufactured from crude oil at a net cost of less than six cents a thousand cubic feet. It is being made at the plant of the American Window Glass Company, whose officers say that it is cheaper and better than coal-produced or even natural gas. No one is admitted to the plant to inspect it and the details of the process are carefully guarded.

The actual gross cost of production is said to be not much below that of natural gas, which is 12 cents; but the cost of manufacture is reduced by the value of marketable residual products, just as the gross cost of coal-produced gas is decreased by the sale of resulting by-products. As the market quotations on these by-products will influence the net cost of the gas, so will the advancing cost of oil per barrel affect the gross cost of production. Officers say that the increase would be very slight, and that crude oil at $1 a barrel would hardly change the present estimated cost.

Definite information in regard to the number of feet obtainable from a gallon or barrel of oil is at present withheld, but it is understood that from 7,000 to 8,000 cubic feet of gas can be made from a barrel of oil. Some believe that the production is even greater, as a ton of Pittsburg gas-coal is made to yield 11,000 cubic feet of gas. The by-products realized in the manufacture of crude oil gas are kept secret, but they are thought to be much the same as those obtained from the refining of oil.

The process, though carefully guarded as to details, is known to consist of generating gas by heating the crude oil and of drawing it out of the generating tank by the aid of suction fans. Thus far, it has been supplied to burners and furnaces direct, but the plans now laid include the erection of a holder, as used by artificial gas companies.

Of even greater interest than the low cost of making crude oil gas is the assertion that it produces a hotter fire than natural gas. This being the case, it promises to be a most acceptable fuel substitute for domestic and mercantile purposes. Standard artificial gases for fuel purposes vary from between 600 and 700 British thermal units, while Indiana natural gas runs about 1,000 heat units. Officers of the American Window Glass Company confirm the statement that crude oil gas is much more intense from a calorific standpoint than natural gas, and it is said to average from 1,600 to 1,800 heat units. This implies that a smaller volume of crude oil gas will have to be used for heating and other purposes. It also means that the pipe lines through which natural gas service has been given to cities and consumers would be amply large for crude oil gas service and that far more efficient service can be given from the new gas.

Natural gas has disappeared entirely from Indianapolis and is rapidly giving out in the one-time famous gas belt of Indiana. If the claims made for crude oil are substantiated, it will probably become a practical substitute for natural gas and can be distributed to the score or more cities and towns which now have idle natural gas mains in their streets. Among these are the Consumers' Gas Trust Company of Indianapolis, whose 131 miles of mains have been out of service for several years.

It is stated that the crude oil gas burns with a rich red flame that does not produce a cutting heat, and it is believed that it will prove a good illuminant when used with an incandescent burner, making a good all-round gas. Interest in cheap gas is growing all over the country. This is particularly true in Indiana, where half a dozen cities are about to grant gas franchises for service to take the place of the former natural gas supply. For that reason interest centers in the Hartford City experiments, as crude oil gas may prove to be the best and most economical substitute for both natural and coal-produced gases.

Canton Needs Water Meters

CANTON, OHIO, is one of a number of municipalities which are suffering from the absence of the water meter system. As is too often the case, the opposition to meters is largely a matter of ignorance and politics. The saloon keeper, the livery-stable man and other large users of water are naturally opposed to the abolition of the inequitable flat rate, which favors the large user and imposes too heavy a burden upon the small consumer. The adoption of the meter system would compel the larger consumer to pay a fair share of the cost of the water supply, hence his objection to it.

If the more numerous small consumers would but appreciate that by the flat rate system a property with a ten-roomed house has to pay according to the number of rooms, while the amount of water consumed may be far less than that in a five-roomed house, and that they have to pay for a large share of the water used by the large consumer, the introduction of water meters would be greatly facilitated. That the meter system is the only fair and equitable system of selling water has been repeatedly and emphatically demonstrated by a great many cities, both larger and smaller than Canton. In some of these the rate per capita has been reduced from a very high rate to as low as thirty gallons per capita. Recently, on a warm evening, Canton was using water at such a rate as to stir up the precipitation in the mains, so that the city was without clear water for several hours. To this has to be added the cost of unnecessary pumpage, and, over all that, is the fact that the city treats its sewage at an expense of several thousands of dollars per year, and in so doing is compelled to treat millions of gallons of unnecessary water because of consumers' open and leaky spigots. Expenses of this character involve the raising of taxes on each property, and thus illustrate another fallacy of the flat rate system. If this were all it might go without very much notice, but the enormous waste of water pouring into the sanitary sewers will bring the city face to face with two problems; one, the extra fuel, the other and greater, the compulsory enlargement of the trunk sewers and sewage disposal plant. The remedy for these evils is to be found in the metering of a large portion of the total supply. Why Canton, a city of its size and a city which in most things is at the forefront, should lose sight of a matter so important is difficult to understand. Sooner or later, meters must be installed, and once they are, everyone will wonder why they have not had them all these years.—*F. E. Meyers, City Engineer.*

The Water-Works of Wilmington, Del.

WILMINGTON pumped from the Brandywine last year 2,951,260,000 gallons, an increase of 93,096,000 gallons over the preceding year. Of the total amount pumped 501,221,000 gallons, or 50.8 per cent., was in the metered class. The water consumed by railroads, manufacturing industries and for other purposes, excepting that consumed by residences, schools and for fire protection, was 1,293,802,000 gallons, or nearly 44 per cent. of the total consumption.

The average daily consumption for the whole city was 8,085,644 gallons. The daily per capita consumption, based on an estimated population of 84,000, was ninety-six gallons, and if the amount used for manufacturing purposes be deducted the domestic consumption amounts to fifty-four gallons per capita.

The pumpage for high service was 640,928,000 gallons, an increase of 20,128,000 gallons over last year; the extreme high service (Rockford Tower) furnished 23,123,000 gallons, a daily per capita consumption, for dwellings only, of thirty-seven gallons.

There were laid last year 10,846 feet of low service distribution mains and 7,471 feet of high service mains. The total length of water mains now in the city is 115.1 miles, of which 48 per cent. is eight inches in diameter or over. Of the 850 fire hydrants now in use, seventeen were put in last year.

The metered service is increasing steadily, and in order to extend this service it is proposed to provide for dwellings where the schedule rate does not exceed $12, by adopting a second minimum rate of $7.50, to apply in such cases, and limiting the amount of water consumed under it to 225 gallons per day. Meters may also be placed on all premises where hoppers are hereafter installed. There are 2,883 meters in service, of which 727 were installed last year.

The total receipts for the year from all sources were $199,552.62, and the disbursements were $149,334.63, giving a balance of $50,217.99. The cost of supplying water per million gallons, figured on total maintenance, was $23.61.

The source of supply is Brandywine Creek and the mode of supply is pumping to reservoirs. On the low service system the pumps are Worthington and Wetherell and on the high service system, Snow and Remington Machine Company.

Bituminous coal to the extent of 5,181,000 pounds, costing $3.50 per gross ton delivered, and having an ash percentage of eight, was used. Of the power used, steam delivered 2,216,572,000 gallons and water power 734,688,000 gallons.

The average static head against which the pumps worked was 112 feet on the low service and 105 feet on the high service. The average dynamic head against which the pumps worked was 122 feet on the low service and 117 feet on the high service. The number of gallons pumped per pound of coal for the low and high services was 524 and 598 respectively. The duty for the low service was 54,800,000 and for the high service, 58,400,000.

The cost of pumping, figured on station expenses, was $14,075 for steam and $937 for water-power on the low service, and $5,250 for the high service. The cost per million gallons pumped was $6.25 for steam and $1.27 for water power on the low service and $7.15 on the high service system. The cost per million gallons raised one foot (dynamic) was 5.1 cents for steam and one cent for water power on the low service and 6.11 cents on the high service system.

The meter rates are as follows:

First 2,000 cubic feet or less per quarter at 75 cents per thousand.

Next 3,000 cubic feet or less per quarter at 60 cents per thousand.

Next 5,000 cubic feet or less per quarter at 45 cents per thousand.

Next 10,000 cubic feet or less per quarter at 40 cents per thousand.

Next 30,000 cubic feet or less per quarter at 38 cents per thousand.

Next 50,000 cubic feet or less per quarter at 37 cents per thousand.

Next 100,000 cubic feet or less per quarter at 36 cents per thousand.

That is, the cost of 200,000 cubic feet is $75.45. All in excess of 200,000 cubic feet is charged at 35 cents per thousand gallons.

The minimum charge is as follows: Five-eighth inch meter, $10; three-quarter inch, $15; one inch, $20; one and one-half inch, $30; two inch, $40; three inch, $50; four inch, $60; five inch, $70, and six inch, $80.

♣

SEATTLE MAY OWN ITS STREET RAILWAYS.—In refusing to grant an application for street railway franchise, the Seattle, Wash., city council has taken the first step toward municipal ownership, and a petition to that end is now being considered. The matter has been a fruitful subject of discussion during several months. The council's Committee on Corporations, to which the question was referred for report, goes on record as follows: "It is our opinion that whatever value attaches to a city franchise should accrue to the advantage of the city. It has become the settled policy of Seattle within the past few years, so far as street railway franchises are concerned, that they should terminate December 31, 1934, and such is the condition of all such franchises now existing in this city." Acting on this report, which further declares that "the method of fixing the valuation of the proposed franchise is subject to criticisms which seem insuperable," the city council has denied the application, thus bringing up the problem of municipal ownership of street railways in tangible form. It is likely that a hearing before the city council will be granted the signers of the petition referred to.

♣

MOTOR FIRE ENGINES seem to be in a fair way to overcome the prejudice against which they have had to contend in England as elsewhere. A combined steam and chemical engine, owned by the city of Liverpool, was able to do good service by prompt arrival at the scene of the recent collision between electric trains, in which the wreckage caught fire. A similar engine recently made a long journey to a fire brigades' demonstration; with a pumping capacity of 600 (U. S.) gallons per minute and a 60-gallon chemical cylinder, a speed of over twenty miles an hour is reached.

LITERATURE ON MUNICIPAL TOPICS*

Reviews of Some Important Books—What the Magazines and Reviews Have to Say about Civic Affairs—Municipal Reports Received

Books

Sewerage and Sewage Purification. By M. N. Baker, Ph. B., C. E., associate editor, *Engineering News.* Second edition, revised and enlarged. Board cover, 16 mo., 153 pages, price 50 cents. Published by D. Van Nostrand Company, New York.

The first edition of Mr. Baker's work under this title appeared nearly ten years ago, since which time much of what was then accepted as gospel in this field has been relegated to the domain of ancient history. The present edition takes ample cognizance of that fact, and benefits greatly from the special visit made by Mr. Baker, in 1904, to European, and particularly English, works of this class. Full weight is given to the development of ideas on such topics as the separate system, the ventilation of sewers, and the various applications of bacteriology to the sewage problem. As a matter closely affecting municipal government and its successful working, we may direct special attention to the author's discussion of the methods under which, as in America, there is a tendency towards charging a special body with the control of sewers and, as in England, the municipal or the local governing body maintains a close grip upon this as upon every other department of public activity, save only in so far as preliminary discussion by committees is concerned.

Elements of Water Bacteriology, with Special Reference to Sanitary Water Analysis. By Samuel Cate Prescott and Charles-Edward Amory Winslow. Cloth, 12 mo., x + 162 pages. Price $1.25. Published by John Wiley & Sons, New York.

A technical handbook, dealing with a subject in which great strides have been made within recent years, and forming a valuable guide to research in this line of work. The references and authors' index are practically a biliography of the subject.

The Cementing Power of Road Materials. By L. W. Page and A. S. Cushman. Issued by the Bureau of Chemistry, Department of Agriculture, as Bulletin No. 85.

This small official pamphlet is capable of doing much good work in the movement towards better roads, if only in showing that there is no longer room, to-day, for the rule-of-thumb methods of determining the character and value of road materials which, to their credit be it said, were so successfully relied upon by Macadam and his contemporaries. Thanks to the investigations carried on by the Massachusetts highway commission, the Maryland geological survey and other bodies, the factors which determine the widely different behavior of road stones are becoming thoroughly understood, with incalculable gain to the interests affected. It is encouraging to learn, from the pamphlet, that the Washington department has it in view so to simplify the various tests as to bring the cost of equipment of a road-material laboratory within the means of all.

Properties of Steel Sections. A Reference Book for Structural Engineers and Architects. By John C. Sample, C. E., M. Arch. Cloth, 121 pages. Illustrated. Price $3.00. Published by the McGraw Publishing Company, New York.

The appearance of this volume is proof, if proof were needed, that the process of standardization to which structural materials, steel in particular, have been subjected still leaves much work for the skilled mathematician and designer. Waste has still to be avoided on the one hand, and risk of danger on the other, and the tables included in Mr. Sample's book are admirably adapted to fulfil these demands when designs are called for at short notice and independent research is out of the question. The text is purposely confined to what is necessary for the proper explanation of the tables.

Experimental Researches on the Constitution of Hydraulic Mortars. Translated from the original of Henri le Chatelier by Joseph Lathrop Mark. Cloth, 132 pages. Illustrated. Price $2.00. Published by the McGraw Publishing Company, New York.

But a small minority of architects and enginers using lime and cement would find themselves able to pass even an elementary examination on the subject dealt with in this volume, and yet it is often important that the why and wherefore of things familiar in our mouths as household words should be known or at least accessible. The present treatise leads the inquiring student from the early history of lime and plaster studies up to the more refined and exact methods of examination and testing in vogue to-day, involving an acquaintance with chemical processes far removed from the Smeatons and Vicats of the eighteenth century. The book can be cordially recommended as a practical exposition of the subject.

Earth and Rock Excavation. A practical treatise, by Charles Prelini, C. E. Cloth, 8 vo., 357 pages. Price $3.00 net. Published by the Van Nostrand Company, New York.

This work, necessarily technical in character, will yet appeal to a large number of local government officials who have not, in readily available form, the data from which this comprehensive treatise has been compiled. The volume covers the entire field, from the best pattern of shovel to the latest type of mechanical excavator—from the ordinary pick to the long list of modern explosives. The section dealing with the direction of excavation work affords valuable hints even to those presumably competent in this branch, and the cost data throughout the volume are based upon an experience of no ordinary kind.

* Any book or periodical reviewed or mentioned in THE MUNICIPAL JOURNAL, or elsewhere, will be sent to any address on receipt of price.

Moody's Manual of Railroads and Corporation Securities. 1905.—Cloth, 7 x 9 inches. 2,600 pages. Price $10. Published by Moody Publishing Company, New York. A book weighing twelve pounds but rarely comes into a reviewer's hands, and yet, in the present case this burden does not prevent a world-wide circulation of the publication. This is not surprising when the wide range of subjects is taken into account, for there is no field of speculative activity uncovered by its pages. Steam railroads, electric traction, gas and electric light, water, telephones, cables, mines, all find their appointed place in this veritable storehouse of statistical data. The dimensions of the work have largely increased since the last issue, and its comprehensiveness and accuracy will secure for it an increasing circulation in business circles.

Articles in American Periodicals

Heating and Ventilation (illustrated), XI., by Charles L. Hubbard. *The American Architect,* July 15, New York.

Methods of Filing Records in a City Surveyor's Office (illustrated), by Fred Gableman, C. E., as published in the *Transit,* University of Iowa. *The Engineering News,* July 20, New York.

America Revisited: The Changes of a Quarter Century, by the Rt. Hon. James Bryce, M. P. This is the second article and deals, in part, with the prevalent errors of American city government. *The Outlook,* April 1, 1905, New York.

Electrolysis Investigations in Germany; The Principles Governing the Valuation for Rate Fixing Purposes of Water-Works Under Private Ownership, a paper read before the Pacific Coast Engineering Congress by Arthur L. Adams, M. Am. Soc. C. E. and *The Significance of Analyses of Effluents from Sewage Works, The Engineering Record,* August 5, 1905, New York.

Tests for New Building Material (concrete), *The Cement Age,* July, New York.

Articles in Foreign Periodicals

Association of Municipal and County Engineers—Annual Meeting at Norwich—(4); *Reinforced Concrete Piling* (illustrated), by A. R. Galbraith, A. M. Inst. C. E. I.; *Steel and Concrete Construction at the Antwerp Water-Works* (illustrated), by E. Devonshire, A. M. Inst. C. E., *The Surveyor and Municipal and County Engineer,* July 14, London, Eng. Price, 3 pence.

Swansea Electricity Undertaking and Tramway Equipment (illustrated), a paper read before the Association of Municipal and County Engineers at Swansea, by C. A. L. Prusmann, M. I. E. E., A. M. I. M. E., borough electrical engineer of Swansea, Eng.; *Swansea Water-Works,* a paper read before the same association by R. H. Wyrill, M. Inst. C. E., borough and water-works engineer of Swansea; *Glasgow Main Drainage,* by Mr. A. B. MacDonald, city engineer of Glasgow, Scotland, and read by him before the Royal Institute of Public Health, London, Eng. Other papers read before the same meeting were as follows: *The Relative Areas of Sewage and Storm-Water Filters,* by Mr. Sidney R. Lowcock, M. Inst. C. E.; *The Kingston-on-Thames Sewage Works—Process and Results,* by Douglass Archibald; *The Present Position of the Sewage Problem,* by W. D. Scott-Moncrieff, F. R. San. Inst.; *The Intermittent Filtration of Sewage as Practised in America,* by Mr. Leonard P. Kinnicutt, D. S., of the Worcester Polytechnic Institute, Worcester, Mass., U. S. A. *The Surveyor and Municipal and County Engineer,* July 28, London, Eng. Price, 3 pence.

Portsmouth Sewage Disposal (illustrated); *Sewage Purification Works of the Richmond Main Sewerage Board,* by William Fairley, A. M. I. C., E. G. S., engineer to the board; *A Short History of the Sewage Treatment of Bolton* (illustrated), a paper by Mr. J. Ashton; *Some Points in the Modern Treatment of Sewage,* a paper read by Prof. Bostock Hill, M. Sc., M. D., at a visit of the Association of Managers of Sewage Disposal Works to Birmingham. *Contract Journal and Specification Record* (and Supplement), August 2, London, Eng. Price 6½ pence.

Public Documents Received

Fourth annual report of The Metropolitan Water and Sewerage Board of the State of Massachusetts, 1904. Henry H. Sprague, chairman.

Manual of the Medford City Government, Medford, Mass., 1905. Michael F. Dwyer, mayor.

Metropolitan Park report, Chicago, Ill., 1904. Alderman John J. Bradley, chairman.

Seventeenth annual report of the Board of Commissioners of the Water and Lighting Department, Harrisburg, Pa., 1904. John A. Affleck, president.

Second biennial report, State Board of Health, Kansas. 1903-1904. S. J. Crumbine, M. D., secretary.

Report of the Commissioner of Public Roads, New Jersey. 1904. H. I. Budd, commissioner.

Annual reports of the city of Newark, N. J., for 1904. Henry M. Doremus, mayor.

Twenty-third annual report of the water commissioners of Bradford, Pa., 1904. J. B. Fox, president.

Annual report of the board of trustees of the Pleasure Driveway and Park District of Springfield, Ill., for 1904. Arthur Hay, secretary-engineer.

Souvenir of the Portland Fire Department, 1905. David Campbell, chief engineer.

Annual report of Kearny, N. J., 1904. Dr. E. H. Goldberg, president of town council.

Report of the Town Council of Montclair, N. J., 1904.

Annual reports of East Orange, N. J., 1903-1904. Edward E. Bruen, mayor.

Report of the superintendent of the water works of Lorain, O., 1904. C. L. Penney, superintendent.

Thirty-second annual report of the commissioners of water works of Newport, Ky., 1904. J. O. Jenkins, president.

Annual report of the city engineer of Haverhill, Mass., 1904. Robert R. Evans city engineer.

Forty-eighth annual report of the board of water commissioners of New Britain, Conn., March, 1905.

Mayor's message and municipal reports of Portland, Ore., 1904. Thos. C. Devlin, auditor.

Thirty-first annual report of the city engineer of Somerville, Mass., 1904. Ernest W. Bailey, city engineer.

Report of Edwin A. Fisher, city engineer of Rochester, N. Y., on recommendation of the National Board of Fire Underwriters' Committee of Twenty, April, 1905.

Bulletin Number Two, Highway Department of the State of Ohio—Construction of County Roads. Sam Huston. June, 1905.

Annual report of the water commissioner of Somerville, Mass., 1904. Frank E. Merril, commissioner.

Annual report of the city engineer of Springfield, Mass., 1904. Charles M. Slocum, city engineer.

Twenty-second annual report of the water department of Madison, Wis., 1904. John B. Heim, superintendent.

Twenty-seventh annual report of the board of health of Lowell, Mass., 1904. William B. Jackson, M. D., chairman.

Annual report of the superintendent of streets and sewers of Springfield, Mass., 1904. Arthur A. Adams, superintendent.

Thirty-first annual report of the water commissioners of Springfield, Mass., 1904. Francke W. Dickinson, mayor.

Report of the state board of health of Connecticut for 1904. Prof. Charles A. Lindsley, M. D., A. M., secretary, New Haven.

Annual report of the state highway department of Pennsylvania, 1904. Joseph W. Hunter, commissioner.

Report of Park Commissioners of St. Louis, Mo., 1903-1904. Robert Aull, commissioner.

Twelfth annual report of the board of electrical commissioners of South Norwalk, Conn, 1904.

Annual report of the wire department of Boston, Mass., 1904. Patrick J. Kennedy, commissioner.

Contributions to Economic Geology, United States Geological Survey. Washington, D. C., 1904.

Third annual report of the state board of public roads, State of Rhode Island, January, 1905.

Twelfth annual report of the Massachusetts Highway Commission, January, 1905.

Thirty-fifth annual report of the board of water commissioners of Wilmington, Del., 1904.

Two Huge Undertakings

THE decision of the Los Angeles authorities to construct a water supply conduit 240 miles in length, at an estimated cost of $23,000,000, recalls the heavy expenditure on a still longer pipe line for the water supply of the Coolgardie goldfields, in Western Australia. While the circumstances calling for this heavy expenditure by the California municipality are exceptional only in regard to the distance over which the water is to be conveyed, the absolute need of water in the Coolgardie case was nothing short of phenomenal. The "gold rush" of 1893 was responsible for the crowding of a large population and industrial plants on an arid tract, distant 363 miles in a direct line from the Port of Fremantle. Water scarcely fit to drink was sold at seventy cents a gallon, and the cost of water to the railway between the mines and the coast ran to $5,000 a day in summer. The works ultimately carried out at a cost of $13,000,000 include a storage reservoir holding 5,520,000,000 of gallons and a thirty-inch steel pipe line 330 miles long. A remarkable feature of the scheme is the exceptionally great head—2,700 feet, including friction—against which the entire volume of 6,720,000 gallons per day has to be pumped. At present the demand is only about one-fourth of the pipe capacity quoted above, which may partially account for the high rates charged for the water. These vary, according to locality and use, from $1 to $2.90 per 1,000 gallons.

The Los Angeles works will no doubt include a much larger diameter of main conduit if, as we presume, the supply is to be by gravity. The execution of the project will be watched by many municipalities whose available supplies of water are nearing an end, and some of these, New York among the rest, may be encouraged by the action of Los Angeles in taking steps toward the realization of projects which, in some cases, cannot be much longer postponed without danger to the public health and general well-being of the communities concerned.

The Chicago Municipal Museum

THE first municipal museum in the United States, opened in Chicago in February, is the subject of a suggestive article, by Matthew McConnell, in the August Bulletin of the League of American Municipalities. Incorporated last year, this institution is an outgrowth of the City Homes Association of Chicago, and has for its purpose "the promotion of intelligence concerning the administration of cities and the problems of urban life, through the assembling of data and illustrative material relating to the processes of civic development, the expert classification of the material and its presentation in a form calculated to meet the needs of both the student and the practical man of affairs."

Though housed by the city, the museum is not a municipal institution and receives no further support from the municipality; so far, the directors and others have contributed the funds, and it is hoped to carry on the work on a voluntary basis. In particular, it is expected that loan exhibits may come in sufficient number to enable a feature to be made of them. There are, however, permanent exhibits, such as charts, pictures and models, the property of the museum, which will surely be added to as the work of the museum becomes known.

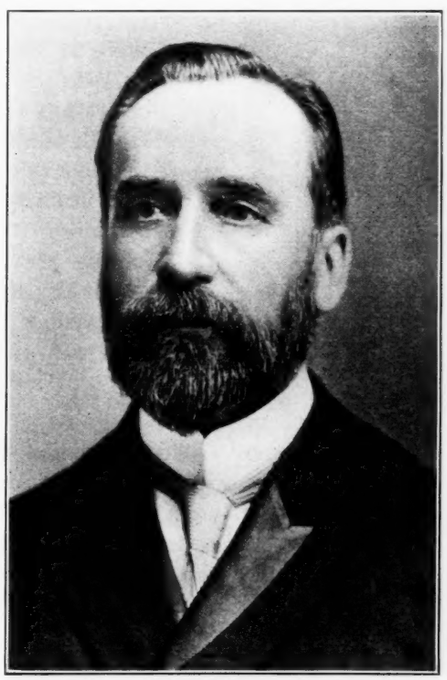
Among the exhibits noted in Mr. McConnell's article are models of New York tenements, "more illuminating than any amount of reading could be, on the way in which the poor of the city have lived and the improvements which have been brought about." Foreign exhibits are described as including some valuable items, special mention being made of maps and other data showing German progress in civic improvements. The article concludes as follows:

"The nature of the museum and its exhibits keeps it from being purely local. In fact, except as it collects statistics of Chicago, it will hold no more of interest for people of Chicago than for any other men and women who may visit it. Nor will the dwellers in cities find more to interest them than will the residents of the smaller towns and villages. Throughout the country there have been organized in late years village improvement societies. Their members will find here many things to interest and help them. The visitor to Chicago always has in mind certain 'show places' which he feels he must see, if his visit is to be a success. In the future it will be well for him to add to his list the Municipal Museum."

AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS

Twelfth Annual Convention to Be Held at Montreal, Canada, September 5-7—Some Features of the Proceedings

A SPECIAL degree of interest attaches to the forthcoming twelfth annual convention of the American Society of Municipal Improvements owing to the place of meeting selected being outside of the United States. Montreal, the great transportation center at the head of ocean navigation on the St. Lawrence, combines the position of a seaport with an inland location six hundred miles from the Atlantic, and is rivaled by few cities in the important matter of accessibility. The patriotism and public spirit for which Canadians have long enjoyed an enviable reputation will go far to ensure a generous representation of the society's membership from the northern side of the frontier line, and it may also be expected that the attractions offered will induce many United States cities to participate in the discussion of topics not limited by geographical considerations.



HON. H. LAPORTE
Mayor of Montreal

The objects of the society which has accepted the invitation extended to it by this flourishing municipality are "to disseminate information and experience upon, and to promote the best methods to be employed in the management of municipal departments, and in the construction of municipal works." Those who have most closely followed its operations are best able to appreciate the value of the work done, not merely in crystallizing the views of members themselves, but in forming public opinion on the important matters with which it is concerned. Standing committees on such subjects as street paving, electric street lighting, sewerage, water supply, street cleaning and garbage disposal are found co-operating with others dealing with the broader aspects of local government involved in taxation, assessments, franchises and legislation, and it is due to the interchange of ideas thus rendered possible that much real progress in municipal affairs has been brought about.

Among the subjects to be discussed at the Montreal gathering we may note reports of committees on municipal data and statistics and a review of the year's progress in paving matters; papers on the legislative functions of Greater New York, and the theory and practice of assessments for local improvements; a review, in three divisions, of municipal work in the Atlantic Coast states, the rest of the United States and Canada respectively, and a description of most of the garbage disposal plants in the United States and some foreign examples in this branch of municipal engineering. In addition, there will be papers by civic officials of Montreal, with special reference to the city's work.

The city itself has much to offer in the way of improvements effected, both by the civic authorities and the varied commercial bodies whose interests are intimately correlated to those of the provincial capital. With a present population of 300,000 in the city proper, a list of 900 streets, 50,000 residences and 9,000 stores and offices, visitors even from crowded centers of population in the United States may expect to find matters worthy of their study. The area of the city is 6,547 acres, its assessed value approximates $200,000,000, and it controls a yearly income of $3,700,000, of which $900,000 is derived from the municipal water-works undertaking.

The matter of transportation has received due attention at the hands of the society and its secretary, Mr. Geo. W. Tillson, Municipal Building, Brooklyn, N. Y. Members, guests and their families are advised to ask for first-class ticket and a convention certificate for each person, which will enable them to go and return for first-class fare and one-third. This applies both to railroads and steamships.

A new feature, first introduced at this convention, is an exhibition of municipal supplies, to be held September 5-9 in the Crystal Rink. Among the hospitalities of the convention, the rides, luncheon and trip down the Lachine Rapids, offered by the city government, will doubtless form an exceptionally enjoyable experience. Those who can conveniently remain until the closing day of the exhibition will naturally have the best opportunities of deriving benefit from this part of the week's business, without detracting from their attention to the convention itself. We shall be surprised, moreover, if the entire number of visitors are able to relinquish the chance of spending a few additional days in surroundings possessing much more than a local reputation for natural beauty.

Water-Works of Ottawa

Ottawa, Ont., laid during the last year 12,627 linear feet of water mains, of which 4,566 feet were eight inches in diameter and over. The total mileage of the water main system is about 106, of which 20 per cent. is eight inches in diameter and over. The cost of the extensions last year was $17,980, of which $7,096 was for labor, and $10,884 for material, and includes the setting of twenty hydrants. The total number of services is 14,498, of which 298 were set in 1904 at an average cost of $16.50 per service, an average length of twenty-five feet and an average depth of six feet. Based on a population of 63,234, there are 4.4 inhabitants to each service.

There were pumped during the year a total of 4,254 million gallons, a daily average pumpage of 11,624,000 gallons, or a daily per capita supply of 184 gallons. The total cost of all maintenance, labor, repairs, collections, etc., was $172,097, and the total revenue from water rates collected was $155,464. The total cost per each 1,000 Imperial gallons was $4.04. The work done by the pumps was as follows: Set No. 1 worked 5,572 hours and pumped a daily average of 1,470,000 gallons; Set. No. 2, 3,617 hours and pumped 917,000 gallons; Set. No. 3, 5,804 hours, 1,461,000 gallons; Set. No. 4, 6,782 hours, 3,302,000 gallons; Sets Nos. 5 and 6, 8,211 hours and pumped a daily average of 4,472,000 gallons. The time worked under fire pressure was fifty-four hours, and the number of alarms was 202.

The consumption was greatest during March, when it arose to 385 million gallons, and was least in November, when it was 331 million gallons. April showed a consumption of 338 million gallons, a drop of almost fifty millions. Assistant City Engineer G. H. Richardson reports, in part, as follows: "The difference between the consumption in March and April is most marked and must be accounted for by the closing of taps, left running during cold weather; and comparing the daily consumption of these months it is evident that running taps in cold weather will consume about two million gallons per day. A more careful examination of the daily consumption shows that the Sunday draught is usually about 500,000 gallons below that of Saturday or Monday, indicating that the quantity consumed for manufacturing purposes is about that amount. Again taking the lowest rate of consumption between the hours of midnight and three A. M. (when there is practically no legitimate consumption going on) it is seen that there is 9,500,000 gallons constantly running which serves no useful purpose. Taking the average consumption during the same period, viz:—10,918,400 and deducting this steady waste of 9,500,000 it is shown that the legitimate domestic use for that period amounted to 1,418,400 which is about twenty-two gallons per capita per diem.

"The real maximum requirement of the city may then be estimated as follows:—

Legitimate domestic consumption, say	2,000,000
Manufacturing	500,000
Allowance for running taps in winter	2,000,000
Total maximum requirement of the city	4,500,000

"Contrast this with the maximum pumped for any day of the year, namely, 12,826,000 gallons on March 10th.

"It is not supposed that a reduction to four and one-half millions could be attained without metering the whole city, but in the light of the experience of other cities there is no doubt whatever that the consumption of water in Ottawa can be reduced to less than seven million gallons by a system of thorough inspection of fixtures. As a preliminary measure the slip of the pumps should be determined and then the consumption for each ward so that the sections of maximum consumption can be determined and the inspection begun there. The importance of reducing this enormous waste may be appreciated if it is understood that at least four gallons are wasted for every gallon actually used * * * *."

♣

Newark, N. J., Has High Pressure Fire Service Mains.—The newly installed high pressure water mains in Newark were tested recently and gave entire satisfaction. The stream from the water tower had a range of over 100 yards and was released at the same time as that from the deck turret. While these were in operation four lines of hose were connected to a hydrant and gave strong streams. Three hydrants were used simultaneously, and Morris R. Sherrerd, city engineer, said that the volume and force attained were equal to the pumping power of ten steamers from the old mains. With all the streams going the pressure was 140 pounds, and when only the four hose lines were in operation, 153 pounds to the square inch. Mayor Doremus declared he was well pleased with the test, and the various city officials expressed gratification over the results obtained from the new system. The experiments made it plain, Mr. Sherrerd said, that in case of fire in the heart of the city the new system could be put into immediate use, and any place of ordinary size flooded with water very quickly.

♣

A Disputed Rule

The contention of the Indianapolis Water Company, that it can require consumers, at its discretion, to use meters, is under examination by the city's legal department. The rule appears in a book issued thirty years ago, and there is some doubt whether it was ever approved by the city council; such approval is necessary under the company's franchise.

♣

The Municipal Gas Plant of Hull, England, furnishes gas to consumers within the city limits at fifty-four cents per 1,000 feet and to outsiders at a sixty cent rate. The gross yearly profits accruing from this source last year were $753,949, of which $210,561 was paid in dividends, while $213,050 went into a sinking fund, as required by Act of Parliament. The net profit was $330,338. United States Consul Hamm gives figures showing that the amount of gas produced by the plant during last year was 1,110,866,000 cubic feet, as against 1,159,730,000 feet the previous year. The number of consumers last year was 152,165 and in the year before 146,457. The total length of gas mains was 858 miles, and the public lamps in the city number 17,361, while in the suburbs there are 2,078 additional.

THE FIRE DEPARTMENT OF DULUTH, MINN., was organized as a volunteer department in 1871 and was placed on a paid basis in 1888, having at that time three steam fire engines, a chemical engine and two ladder trucks. At the present time the department consists of eighty-seven men and is under Chief John T. Black, who has been in command since 1894. Mr. Black was formerly assistant chief of the Milwaukee, Wis., and chief of the St. Paul, Minn., departments. Last year there were 275 fire alarms, of which 159 were telephone and 103 bell. The department worked 754 hours, traveled 1,249 miles, laid 125,150 feet of hose, used 4,700 gallons of chemical-engine water, raised 5,479 feet of ladders and used 198 gallons of hand chemical extinguishing fluid. The loss on buildings was $78,517.42, and on contents $98,669.03, making a total loss of $177,186.45. The insurance on buildings was $795,342; on contents, $290,250, giving a total insurance of $1,085,592. The average loss for each fire was $673.33. The total cost of the department was $102,889.60.

THE FIRE DEPARTMENT OF MEMPHIS, TENN., has a manual force of 129 men and sixty-nine horses, the apparatus and equipment in service being as follows: ten engines, ten hose reels and wagons, one of which is a combination; one aerial truck and two combination city trucks and chemicals; one water tower, a fuel wagon and one supply wagon; 17,000 feet of two and one-half inch rubber lined cotton hose. There are ten engine houses and a repair shop. In reserve are one engine, two hose reels and wagons, one double-tank chemical engine and 6,000 feet of chemical hose. The fire alarm system consists of one Gamewell eight-circuit repeater and seventy-one street boxes; telephone lines to each of two telephone companies; direct wire to two private fire alarm companies and to the police alarm system; the latter is of the Gamewell type and has twenty boxes.

Rebuilding Manila

WHEN the Americans marched into Manila on August 13, 1808, it was the filthiest place in the Orient; to-day it is one of the cleanest cities east of Suez, and the tourists who visit it pronounce it the most attractive spot in all the East, writes Bradford Daniels in the September *World's Work*. In six years it has been transformed from a medieval city, fallen into decay, into a center of twentieth-century activity and enterprise.

The three things most needed in Manila at present are modern water and sewer systems, and modern and thoroughly equipped hospitals for the poor both in the city and in the provinces. All three of these wants are to be provided for. A committee has made plans for a civil hospital to cost more than $1,000,000. It will be built on the pavilion plan.

The plans for harbor improvements involve an expenditure of about $4,000,000, the work being in charge of Major C. McD. Townsend, an engineer in the United States Army. The city will soon have a new telephone system, too.

Every city has its pet organization, and in Manila the fire department holds this distinction. The Filipino finds his shack in flames; he runs to the nearest telegraph pole and pulls a hook, and before he has had time to take a fresh chew of betel nut the engine is at his door and the danger is past. It is all very wonderful, more marvelous in fact than the charm against cholera which the priest sells him, and the men in helmets and rubber boots are a sort of demigods.

Nor has the beautifying of Manila been neglected. Mr. D. H. Burnham, the famous architect and landscape gardener, has planned an elaborate system of parks and boulevards. Manila will be the "city beautiful" of the Orient.

FT. WAYNE, IND. SPENT $10,800 FOR STREET REPAIR AND MAINTENANCE last year. The total length of paved streets is thirty-five miles and the total cost of cleaning them amounted to $11,911. The city employs an automatic street flushing machine and regarding its work, Henry C. Franke, superintendent of streets, reports as follows: "The automatic street flushing machine has proven itself to be an excellent machine as long as we could produce a sufficient pressure back of the water in the tank, but owing to the fact that the pressure of the water in the mains generally is quite low, we were not given an opportunity to use the machine to any great advantage. If operated under favorable circumstances it will remove practically all particles of dirt and dust from the street, thus cleaning them perfectly." In regard to vitrified brick as crossing material, Mr. Francke says: "The use of vitrified paving brick in the construction of street and alley crossings on unimproved streets has proven to be a success. At the prevailing prices of good oak lumber these brick crossings can be put in just as cheaply as oak lumber crossings and are far superior in point of durability and every other respect. I would recommend that the oak crossings be dispensed with entirely and that nothing but brick be used in crossings hereafter constructed." Besides the flushing machine the department has the following apparatus: three street sweepers, three steel road graders, one dump scraper, one hose cart, one plow, 500 feet of two and one-half inch rubber hose and much minor equipment.

THE FIRE DEPARTMENT OF FT. WAYNE, IND., has in service seven steam fire engines, eight hose wagons, one aerial extension ladder truck, one hook and ladder truck, one chemical engine, one fire alarm wagon, one chief's buggy and a coal supply wagon. The manual force of the department is sixty-one men and there are forty-two horses in service. There is 11,000 feet of hose. The fire loss for last year on buildings and contents amounted to $74,016; the insurance was $516,864 and the insurance paid amounted to $72,466. There were 266 fire alarms during the year, of which fifty were still and the remainder box. The false alarms numbered nine.

On the Way

IT says much for the advance in public opinion to find, in the "Boston Evening Transcript," the statement that "the judgment of thoughtful men inclines more strongly to the belief that all our cities should own all their public utilities; some form of municipal ownership is surely coming."

THE WADSWORTH MACADAM—THE COMING ROADWAY

By W. C. Thoma

KENTUCKY rock asphalt is the coming road material; it produces a dustless, noiseless, mudless, and inexpensive roadway, requiring less work to construct them an ordinary macadam road.

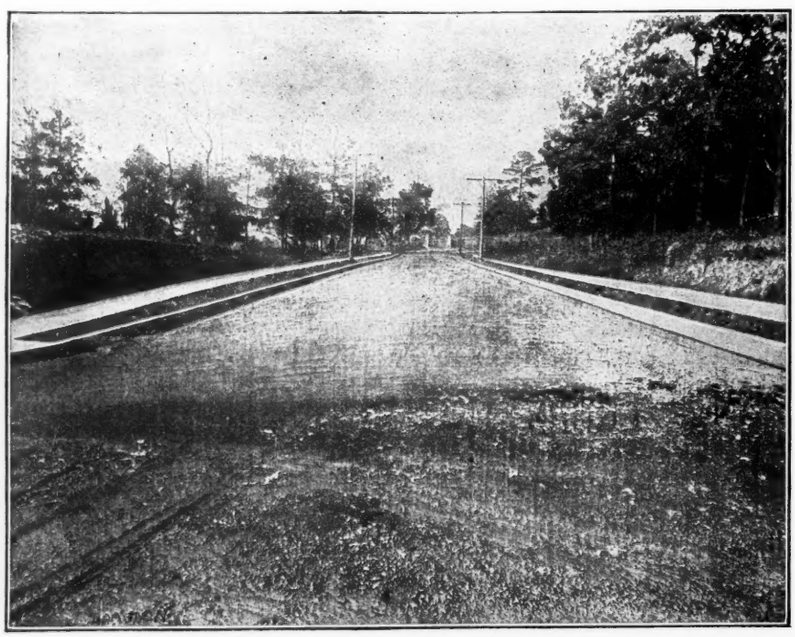
Kentucky rock asphalt is used raw—no heating being necessary. The only machine needed to construct a roadway of this material is an ordinary steam road roller. The asphalt is of such a homogeneous nature that the rolling and subsequent travel over the road are sufficient to pack the roadway almost as hard and smooth as a regular asphalt pavement.

Numerous experiments in the Pittsburg yards of the Wadsworth Stone & Paving Company prove that the proper way to use this material is as follows:

Shape and roll the dirt-bed thoroughly, as if a regular macadam or asphalt pavement were to be constructed. Next, place and roll a six-inch layer of good crushed stone, about two-inch gauge. Then spread a two-inch layer of the same size stone, and on this second layer, before it is rolled, spread an inch of Kentucky rock asphalt, and, after again thoroughly rolling, the road is ready for traffic.

This system of road construction is simpler and requires less labor than the old macadam road, saving the handling of several grades of stone and one or two rollings. After it is turned open to traffic it beats down much harder and more quickly than the other, and is never dusty, muddy or slippery.

The reason it is never dusty is that, being of an oily nature, it does not form dust. Should dirt be carried onto the roadway from an adjoining unpaved road, it can be washed or swept off with as little damage to the roadbed as in the case of a regular asphalt or brick pavement.



HALL AVENUE, BIRMINGHAM, ALA.

The oily nature of the material causes it to pack hard around the crushed stone, making it impossible for water to be absorbed. For the same reason, no matter how steep the grade, it will not wash.

The Wadsworth macadam roadway will outwear a limestone, macadam, or sheet asphalt pavement because the wear does not come on the asphalt, but on the stone. The asphalt simply works down among the crushed rock foundation, packing the stone together and making a stone pavement—the most durable pavement known.

The following letter from Mr. John Oman shows that Kentucky rock asphalt was used ten or twelve years ago in Nashville:

"About ten or twelve years ago there was a sample carload of Kentucky asphalt sent to Nashville and put down at the intersection of High street, now Sixth avenue, and Union street. The surplus of raw asphalt left after putting down the sample was taken to another street and put down on the ordinary macadamized surface without being heated or prepared in any way. Some years after this, Mr. Nester, then one of the members of the board of public works, called my attention to this asphalt. The rest of the street had worn down, showing the asphalt above the surface. Mr. Nester was very anxious at that time for the city of Nashville to try what he called "raw asphalt," but for some reason his idea was never carried out, although the sample stood the test of very heavy hauling on it for a number of years, far better than the heated or prepared asphalt."

The man who really introduced Kentucky rock asphalt for macadamized road purposes was Mr. James A. Omberg, Jr., city engineer of Memphis, Tenn. He made an experiment by dumping a small quantity on a worn out piece of brick pavement. In a week's time he found that the regular traffic over this spot had packed the asphalt down until it had every appearance of a regular sheet asphalt repair job. He was so pleased with his experiment that he immediately laid two blocks on one side of Forest Park. This roadway was built on the macadam plan. It has now been in use a year and is so satisfactory that seven more blocks have just been laid.

Last April, Dunn & Lallande Bros., Birmingham, Ala., laid a sample block on Hall avenue, leading to the Country Club. The accompanying photograph shows a dirt road in the foreground and Wadsworth macadam beyond. The piece of roadway is now the best in Birmingham, and is constantly improving. Practical roadmen call it the best piece of macadam roadway they ever saw.

Bowling Green, Kentucky, is the largest town to try the Wadsworth macadam. The following editorial from the "Times-Journal" of that city shows how this system of road building is being received:

"The asphalt has been put down on a section of the public square and is already being beaten down by the travel over it. The experiment gives every promise of proving entirely successful, and if it does, in a few years all Bowling Green's principal streets will have asphalt surface. The streets will then be less noisy, more durable, not subject to wash by heavy rains and considerably less expensive than the streets as they are built at present."

The initial cost of the Wadsworth macadam is fifteen (15c) to twenty-five (25c) cents per square yard higher than ordinary macadam, but is soon covered in the extra cost of maintenance. No matter how level the roadway may be, or how well a macadam pavement may be constructed, it will wash, requiring constant repairing, and although the cost may seem insignificant, it amounts to a considerable item in a year.

The Wadsworth macadam will wear out and need repairs, the same as an asphalt pavement, but is much more easily repaired. All that is necessary is to place some broken stone in a low spot and spread a coating of asphalt over it; a steam roller will help, but the regular traffic will give sufficient packing.

The comfort of traveling over a roadway as dry and free from dust as the best asphalt pavement, yet lacking that noisy clatter, is to be considered. True, no roadway could be better than the old macadam when it is in prime condition; but how often is it in that condition?

Automobilists and the public in general are clamoring for better roads. The country has thousands of miles of improved roadway to build. Paving is too expensive for the country districts; macadam and gravel roadways are not satisfactory; steel tracks have not been found practical—what is to be done?

The principal advantage of using Kentucky rock asphalt for macadamized roads is that it possesses all the qualities of a regular asphalt pavement at half the expense. Owning and operating the mines, sample cars are offered at a 25 per cent. discount. Every municipality interested in bettering its highways should write to the Wadsworth Stone and Paving Co., Pittsburg, Pa., for full particulars, or better still, order a sample car and test it for themselves. The cost is slight, and judging from the experiments in Nashville, Bowling Green, Pittsburg, Birmingham and Memphis, the best results are assured.

Bitulithic and Tar Macadam—The Difference

EARLY in 1901 the tar-macadam pavements of Hamilton, Ont., were given unstinted praise and brought to the attention of American road builders by means of flattering consular reports. They were heralded as the solution of the street paving problem and a brilliant future was predicted for them. Their low first cost was the supreme factor and the prediction was freely made that they would rapidly supplant all forms of bituminous pavements. The late Mr. F. J. Warren personally investigated the Hamilton pavements, their theory of construction and what he considered the haphazard manner in which they were laid. Mr. Warren's long experience, covering a period of over twenty years in the refining of asphalt, the manufacture of bituminous cements and the laying of pavements, eminently qualified him to accurately judge the value of tar macadam pavements. In a conservative manner he pointed out the weaknesses of tar macadam, predicted their failure and furnished logical reasons why a uniformly successful pavement could not be assured under the method of construction which had been adopted. Mr. Warren's statements were bitterly resented by the Hamilton authorities as unwarranted, and were alleged to have been inspired by ulterior motives. Mr. Warren, in his criticism of tar macadam pavements, had pointed out that varying success only could be hoped for under the careless methods by which the pavements were laid, and that the results would not differ from hundreds of failures which occurred years ago when tar and pitch had been improperly used. In 1901 and 1902 the city of Hamilton expended about $200,000 on tar macadam, but since that time has laid no new work, the highway department having been kept busy repairing with crushed stone the holes which had developed in that already laid.

This year the city appropriated $15,000 for repairs to its tar macadam streets, and the highest authorities there admit that this large amount of money will put but a few of the streets in good repair.

Toronto, Ont., has had an experience with tar macadam similar to that of Hamilton. In 1900, 1902, 1903 and 1904 several tar macadam streets were laid. This work was done under the supervision of seven different contractors, who were given ample opportunity to demonstrate their ability to lay a proper pavement under the ordinary tar macadam plan, and the results are very far short of what is desired in a first class pavement under the various conditions of traffic.

Attempts have frequently been made to compare the bitulithic pavement to tar macadam. They are alike in one particular and one particular only, and that is that they are composed of stone and bitumen. At this point all similarity ceases. Tar macadam is a mixture of stone and crude coal tar. No attempt is made to grade the stone so as to form a compact pavement. The stone is placed on the street in layers, the coarser grades on the bottom and the finer on top, the voids between the stone being filled with coal tar, the life of which under exposure is short, as experience has demonstrated. In its crude state coal tar has few cementing qualities. As the late Mr. F. J. Warren has truly said: "Tar is not a cement unless made into one."

All municipal officials are now more or less familiar with the method of construction of the bitulithic pavement. It is a combination of the hardest stone and bitumen, the stone being so accurately graded that the voids are reduced to a minimum and so arranged that they sustain the weight of traffic, the bitumen being used merely to hold the stone in place. "If," as one eminent engineer has said, "it were possible to wave a magic wand over a bitulithic pavement and remove from it all the bitumen at one stroke, the result would be the finest macadam road in the world, and one that would wear for years." The thorough study upon which the specifications for this pavement have been based and the care with which it is constructed put bitulithic in a class by itself, and the success of the pavement proves that it pays to design a pavement in scientific principles.

The demand which the good qualities of the bitulithic pavement had created naturally aroused competition. It was recognized that the bitulithic pavement was here to stay, that it had been proof against the bitterest attacks of the most powerful and influential organizations, whose ramifications extended from the nation's capitol to the smallest hamlet, but the demand continued to exceed the means of the inventors to meet it. This gave competitors an opening they were quick to take advantage of, and they entered the field equipped with a few tar kettles and a large supply of assurance, but no experience. The results of their temerity are found in the same old tar kettles, a depleted stock of assurance, a large supply of sad experience and the absolute knowledge and firm conviction that to construct bitulithic pavement requires an equipment vastly beyond the means of the ordinary contractor, a scientific training in the use of bitumens, a practical knowledge of the qualities of stone and an engineering experience of large proportions.

The principles involved in the bitulithic pavement construction are so novel that twenty-six United States patents have been issued and others are pending. These patents cover the processes and apparatus used in the manufacture of the bituminous cements, the methods and apparatus used in the construction and the resulting pavement.

While the contractors who attempted the bitulithic experiment are rich in sad experiment, the municipalities who accepted the imitation of bitulithic are poorer in pocket and poorer in pavements, as every attempt to duplicate the original resulted only in failure, not a single successful, satisfactory street being the outcome of a dozen or fifteen attempts to produce a pavement equal in any particular to the bitulithic. Contrast this record of failures with the unparalleled record of success of the real bitulithic. Of the 2,500,000 square yards of bitulithic laid, but one small section has been unsatisfactory, and this was due to the peculiar local conditions at the time of construction, over which the contractor had no control.

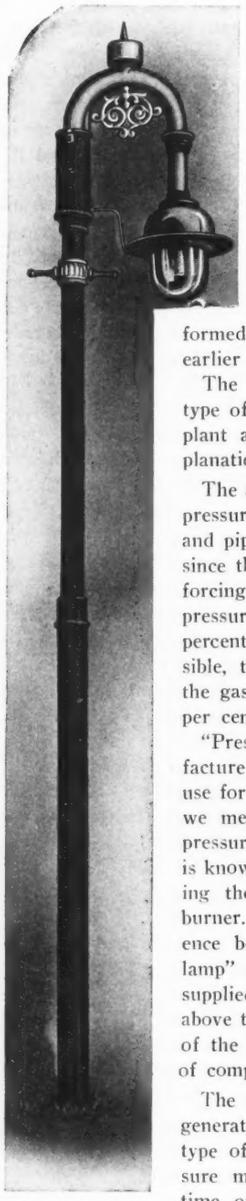
The lesson to municipalities is obvious. If the bitulithic pavement is desired a city should accept no substitute. The construction of this pavement requires a technical knowledge possessed by no one at the present not under the immediate supervision of its inventors. Every street requires different treatment, according to local conditions and the nature of traffic, and it is therefore impossible to draft a set of specifications that will meet all cases. If the competitors of the bitulithic can lay a good imitation they have not done so, and the risk to municipalities would appear to be too great to warrant the latter in accepting a substitute at a slighly lower price than bitulithic.—*Thomas F. Murphy.*

Asphalt Repairing Plants

HETHERINGTON & BERNER, of Indianapolis, who are among the best known manufacturers of asphalt plants in the country, recently shipped a complete repair plant to the Union Asphalt Construction Co., Saginaw, Mich. They are now at work on a plant for Hy. Moyer, the well known paving contractor of Erie, Pa., and are also building a municipal asphalt plant for the city of Detroit, which will make two of their plants in use by that city. Another plant of special interest, on which they are now engaged, is for the Parker-Washington Company's work in Chicago. This will be the largest plant in the world, having a daily capacity of 4,000 square yards of finished pavement.

An Important Development in Gasoline Lighting

IN the latter part of 1903 a new street lighting system at Northboro, Mass., was brought to our attention and we published in January, 1904, an illustrated description thereof. Having since received most favorable reports regarding this method of street and town lighting, a JOURNAL representative recently visited Northboro and adjacent towns, and was surprised to see the advance that had been made, not only in the candle power of the lamp and in the simplicity of construction, but the thoroughness of the work and the manner in which gasoline has been "harnessed" and utilized.



AUTOMATIC INCANDESCENT LAMP.

The business was originally started by the Automatic Incandescent Light Company, having its main office in Philadelphia, but owing to patents and improvements of T. H. Blair, whose home is in Northboro, a new company, the Blair Light Company, has been formed as successor to the business of the earlier corporation.

The automatic lamp in use is a distinctive type of light producer, as it is practically a gas plant and lamp combined. To make our explanation clear, we will use comparisons.

The advantage of burning gas under a greater pressure than it is practical to maintain in mains and pipes has long been recognized, particularly since the advent of the incandescent mantle, as forcing the gas to the burner under increased pressure admits of the introduction of a larger percentage of oxygen than is otherwise possible, thus increasing the effective capacity of the gas, sometimes as much as several hundred per cent.

"Pressure Incandescent Lamps," which manufacture their own gas, have also been in limited use for a number of years. By "pressure lamp," we mean a lamp burning gas forced at high pressure from the nozzle or injector into what is known as the mixing tube, and thereby drawing the maximum of oxygen (air) into the burner. This is the essential feature of difference between what is known as a "pressure lamp" and a "gravity lamp," the latter being supplied with gasoline, by gravity, from a tank above the lamp, and only taking a small portion of the oxygen needed, therefore giving a light of comparatively very low candle power.

The pneumatic pressure lamp uses pressure generated by pumping air into a tank. In this type of lamp, it is necessary to create a pressure much greater than that required at the time of starting, in order that its constantly diminishing pressure may not reach a point where the light will go out before a desired time. In order to lessen this trouble a tank too large to form a part of the lamp is usually adopted; it is connected to the lamp by small tubing. While a high candle power can be developed by this system it has never been made practically available for street lighting.

The automatic pressure lamp of the Blair Light Company needs only the application of heat to the generating coil for a few seconds, when the gasoline is converted into gas; this exercises a pressure not only in the coil, but in the tank, forcing the gas down to the nozzle, by which it is injected across an open air space into a mixing tube, and thence carried to the burner, where it is lighted by the flame from the heat, thereby producing light. The light in turn furnishes heat to generate gas from the gasoline in the coil, the process continuing until the fluid is exhausted, when the lamp will go out, or, if desired, it may be put out by a movement of the hand, but there are no valves to turn. This point is another of the many advantages possessed by the "Automatic" lamp over both the gravity and pneumatic lamps. With either of these latter types, if the lamp goes out prematurely the fluid in the tank escapes, while should the "Automatic" lamp go out prematurely, none of the remaining fluid gets away.

Briefly, the "Automatic" lamp creates and maintains its pressure by the waste heat of combustion and, consequently, does not require an air pump and tank large enough to contain a supply of air and fuel. This pressure is positively uniform and the amount of gas generated is automatically controlled by the lamp.

The town of Northboro is still lighted by this system, and has gained the reputation of being the best lighted town in New England. At the last town meeting, held to award the contract, there was not a dissenting vote against the town continuing the system.

The Blair Company is putting out several types of lamps and fixtures so as to meet every possible requirement with its "Automatic" lamps for outdoor lighting. We illustrate herewith the type known as Model C. The tank containing the gasoline is of cast iron, and forms the upper part of the lamp pillar, the fluid being conveyed to the lamp by the small tube which is carried through the lamp and forms the generating coil and connection; the pressure is thus returned to the top of the tank through the supporting crook, which is utilized as a draft chimney.

The working parts are readily accessible, the lamps highly ornamental, strong, symmetrical and apparently capable of giving efficient service for many years. The company lays great stress on the belief that a fixture giving light at night should, if possible, be ornamental by day. This lamp apparently cannot be made to go wrong without wilful intent, and it is as easily lighted as the average kerosene lamp. The light produced by it is marvelous; in fact, any one at a short distance would conclude that it was one of the latest types of enclosed electric arc lamps, except that the light is softer and more steady.

At Shrewsbury, adjoining Northboro, and at Worcester we found sections of these towns lighted by the same system, and thirty or forty lights burning in one of New England's largest outdoor places of amusement, the White City at Lake Quinsigamond, formerly the border line between Worcester and Shrewsbury. One of Worcester's representative clubs is entirely lighted with these lamps, one of them burning in the grill room, elevated only a few feet distant from a coal fire.

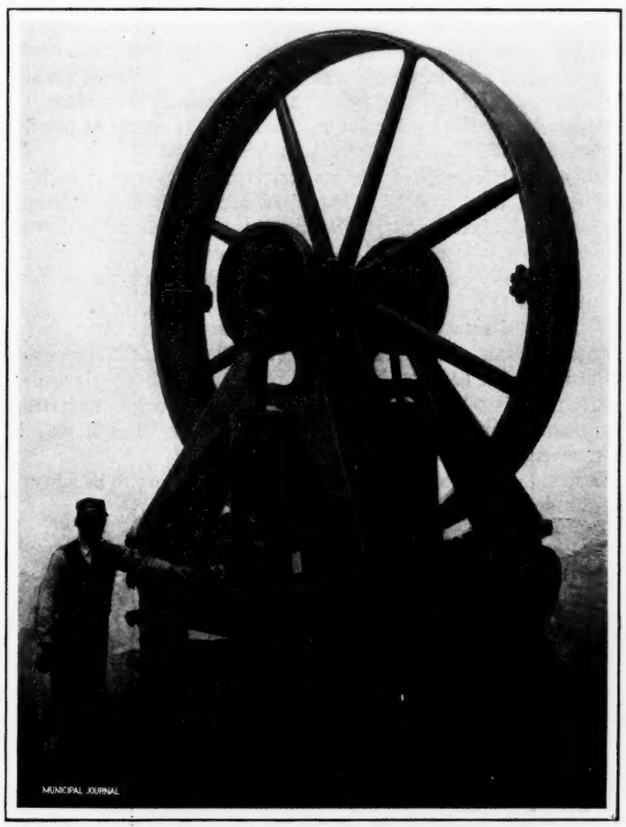
A feature of the 1905 lamp, while possible with the old model, which has been carried to a greater perfection and placed under better control, is the faculty of changing the candle power and consumption of gasoline. The light can be changed in a few seconds from a 300 nominal candle power to a 1200 or even 1500 nominal candle power. This is accomplished by merely turning a dial, which allows the automatic supply valve to close at the lower or higher pressure, as desired. The pressure at which the lamp burns governs both the brilliancy of the light and the consumption of gasoline; consequently, if on an installation a low candle power, with an economical burning lamp, is desired at one point the lamp is adjusted accordingly, while, if at the next point a high candle power lamp is desired the result is as readily achieved.

Owing to this capacity of adjustment it is difficult to give a schedule of cost of maintenance, but the following is taken from the advance sheets of the company's catalogue: "At 10 lbs. (the pressure at which the lamp is set when sent from factory), it will burn about 4½ hours to a quart of gasoline, and yield a 1200 candle power light, superior in quality and apparently equal power to the average electric arcs. At 5 lbs., it will burn about 10 hours to the quart, and produce about 300 candle power."

No other means, within our knowledge, of producing high candle power light has ever been capable of such adjustment. The company's new illustrated catalogue gives complete information regarding these lamps and will be sent on request.

A New Power Pump

THE power pump shown in the accompanying illustration is designed to give economy in the application of power for pumping water under pressure and to be run by a Corliss engine. It is claimed that in the best high-duty steam pumps any change in the water pressure, volume of water displaced or amount of work done from that originally provided for, or any defect in the water end, is followed by a loss of economy in the steam end, while this pump keeps the percentage of efficiency and economy substantially the same, the amount of work accomplished varying within wider limits. In many cases high-grade Corliss engines and low-duty steam pumps are in operation under one roof. As this pump is made to run smoothly from line or engine shaft, whether the speed of the shaft is low or high, a saving in fuel is necessarily effected. The



THE BETHLEHEM POWER PUMP

motion is steady and uniform, and two or more pumps can be run from one engine or motor.

The capacity of these pumps ranges from 100,000 gallons to 1,500,000 gallons per twenty-four hours, and patterns are being made for pumps ranging up to 3,000,000 gallons; the pumps are being used in cities having an aggregate population of 50,000. If there is reason to suspect waste in fuel in machinery now in use, full information as to possible improvements can be had by addressing the Bethlehem Foundry and Machine Company, South Bethlehem, Pa., the makers of this form of pump.

Manufacturers and Exhibitors of Fire Department Apparatus and Supplies at the Duluth Fire Chiefs' Convention

As the largest manufacturers of fire department apparatus and supplies in the world, the American-La France Fire Engine Co. were prominently represented at this convention. Among those present in the company's interests were C. J. Cross, general sales manager; O. S. Doolittle, R. Ross Holloway, T. R. Polglaze, J. Thomas, Bernard Bosch, A. H. Miller, Harvey Mitchell, John McElroy and others.

The satisfactory service which apparatus of this work is giving in the Duluth fire department is but a representative instance of the performances of the American-La France products.

Mr. F. C. Stover, of the Gamewell Fire Alarm Telegraph Co., read before the convention an interesting paper on "Advantages of Fire Alarm Equipment in the Fire Department."

The Gamewell Company had an attractive exhibit in the convention hall, showing the latest improvements by which they continue to improve and perfect their well-known system.

Mr. C. W. Black, manager of the Seagrave Company, distributed photographs of himself which were highly appreciated by the visiting chiefs. Mr. Black's motto is, "Don't monkey with cheap fire apparatus," and every fire department which has used the Seagrave hook and ladder trucks is well aware that it is worth while to pay for good material and workmanship in this line of purchases.

The Firestone Tire & Rubber Co., of Akron, O., were represented by their sales manager, Mr. Joe M. Gilbert, well known in the fraternity as an active exponent of the company's rubber tire for fire department apparatus.

The chemical tanks and fire extinguishers exhibited by the Diggs Fire Extinguisher Company brought considerable business to Mr. D. W. Diggs, well known as president of the company. The Diggs engine tanks, for installation on hose wagons or trucks, are built in any desired capacity from 20 to 100 gallons; they are thoroughly tested and guaranteed in every respect.

The Fabric Fire Hose Co., of New York, were represented by M. H. Hart, a familiar figure at these gatherings. The Fabric Co. had their headquarters at the St. Louis Hotel, where their receptions were largely attended and highly appreciated.

The Glazier Nozzle & Manufacturing Co., of Indianapolis, showed their valuable specialties in the line of nozzles and sprinkler outfits. Mr. Glazier distributed a new catalogue, just issued by the company.

The Ahrens Fire Engine Co., of Cincinnati, were represented by their sales manager, Mr. John P. Ahrens. Their new factory, which is now in full running order, is equipped with the latest and most improved machinery for meeting the large demands upon their resources.

Mr. I. B. Markey, the fire-hose veteran of the Eureka Fire Hose Co., was a center of attraction at his headquarters in the Spaulding Hotel.

Mr. Cyrus Robinson (Samuel Eastman & Co.), had his nozzles and deluge sets on exhibition at the Armory. Tests showed what excellent streams can be thrown by the use of this equipment, even where low pressures have to be relied upon.

Electrical Power from City Garbage and Refuse

THERE are indications that the question as to whether power can be developed from American mixed city garbage and rubbish is about to be answered.

Contracts have been awarded at Sacramento, California, and at Westmount, Province of Quebec, for the installation of Meldrum patent "Simplex" garbage and refuse destructors, in both places in conjunction with the municipal electric lighting stations. Each of these installations will have a capacity of fifty tons of mixed city waste per twenty-four hours, and will develop steam power equal to the evaporation of three-quarters of a pound of water to each pound of waste consumed. No coal or other fuel will be used.

The plants are guaranteed to consume all waste without objectionable odors or fumes. The temperature to be obtained in the combustion chamber will range between 1,800° and 2,500° Fahrenheit. Each destructor will be provided with a regenerator for heating the forced air blast under the ashpits of the furnaces, delivered through the Meldrum patent steam jet blowers.

The Westmount installation will be provided with a 200-hp Babcock & Wilcox boiler, and that at Sacramento with a 150-hp water-tube boiler.

The installation at Westmount is being made under the direction of W. F. Morse, 17 Battery Place, New York, American representative of Meldrum Bros., Ltd., of Timperley, England, and that in Sacramento by P. F. Dundon's San Francisco Iron Works.

Norfolk, Va., City Council to Compare Bitulithic and Asphalt Pavements

AT a meeting of the Norfolk, Va., select council on August 1st, it was decided that in addition to a committee of one member from each branch of the city council to visit various Western cities to inquire into the kinds of pavement in use in those cities, the city engineer should be sent also, and that the two members and the engineer should constitute a committee to make recommendations in the matter to the councils.

A letter from Lieut. C. P. Shaw, president of the Norfolk Municipal League, read at the meeting, dealt mainly with a report recently made by City Engineer Brooke, and referred also to a recommendation, by the street committee, of asphalt as a paving material for Main street, the basis of this advice being certain advertisements of the Barber Asphalt Company and "some newspaper clippings presumably from the same source." Lieut. Shaw then proceeds, in his letter, in part as follows:

"The Norfolk Municipal League, in conformity with its policy of impartial investigation, wrote to the mayors of the cities where the alleged defects in bitulithic were said to have been found. All the replies that have been received agree in flatly denying and contradicting the statements made in these attacks on bitulithic, and thus demolish this prop to the street committee's report.

"In the first place, it must be noted that in order to make a valid comparison between two things, so as to show their relative merits, it is absolutely necessary to know the essential qualities of both; otherwise a comparison is impossible, or, if made, is worthless.

"It is seen that bitulithic was patented in 1901, 1902 and 1903. Of the authorities quoted, General Gillmore died in 1888, and, being an engineer and not a prophet, was not a competent expert witness to testify to the merits of an invention patented thirteen years after his death. For the same reason, the quotations from other authorities, dating from 1885 to 1898, do not refer to bitulithic. The last one quoted (1902), could not, without the gift of prophecy, be made to apply to an article patented in 1903. The reference to Mr. Clifford Richardson and the New York testing laboratory may well be dismissed as worthless, since the laboratory belongs to the Asphalt Trust and Mr. Richardson is merely the Trust's head chemist and must look out for the interests of his employer. (See MUNICIPAL JOURNAL AND ENGINEER for June, 1905, page 290.)

"The remarks quoted from Warrens in regard to coal tar as a paving material refer to that substance as it was used in the obsolete types of tar macadam of twenty or thirty years ago in Washington, D. C. Most of these pavements have been replaced by asphalt, and yet in the report of Professor Dow, the expert on bitumens for the District government, in the MUNICIPAL JOURNAL AND ENGINEER for March, 1903, is to be found a list of tar macadam pavements still in use that had lasted for twenty-six to thirty-one years before it was necessary to resurface them, and the average cost of repairs to which was only 3 1-6 cents a year per square yard. In his remarks Professor Dow says: 'In fact, the long life of these old pavements can only be looked upon as a lucky accident and for this reason it is a remarkable illustration of what coal tar bitumen can do by chance, even under unfavorable conditions. The many failures of the past indicate how they may be avoided in the future, and the valuable lessons learned from these failures, together with the scientific methods employed in the construction of the Warren coal tar pavements, insures uniform success for the future for what has hitherto been obtained by chance.'

"Now asphalt in its turn seems to be giving way before bitulithic, if we can believe the official and disinterested replies from mayors, city engineers and boards of public works, received in answer to the impartial circular sent out by the Norfolk Municipal League; and these must be believed, as the only other tenable hypothesis is that all these gentlemen are conspiring to push bitulithic.

"From the fact that this pavement is being laid in increasing quantities each year and in cities where it has been in use for several years, the only reasonable supposition is that it differs greatly from all other tar macadams and is their superior.

"The greatest living authority on roads and pavements is doubtless Professor Shaler, late of the Massachusetts Highway Commission. In his "American Highways," page 225, he says: 'Asphalt pavements are apparently not well fitted for use where traffic is of the heaviest kind, for the reason that the rate of wearing is, under these circumstances, great. In regions of excessive heat pavements of this description soften to such an extent that the wearing is much accelerated.'

"The President of the League brings these matters to the attention of the councils, not to advise its selection of any particular pavement, but to show the reasonableness of the first suggestion of the League 'that there is grave doubt as to the advisability of paving Main street with asphalt' and to urge that the only satisfactory way to determine the relative merits of the different pavements is to send a committee, composed of men who are known to be free from all prejudice or partiality, to inspect those pavements under the conditions of actual use, in those cities which have a sufficient mileage of the various kinds to afford conclusive evidence of their respective qualities and where the climatic conditions are as nearly as possible those of Norfolk; namely, Nashville and St. Louis.

"When the advocates of any particular pavement oppose such an investigation, they must be prepared to accept the plain inference that they do so because they fear that their pavement will not stand the test of a thorough and business-like examination which the League asks may be made with the sole object of securing for Norfolk the very best pavement.

"From what precedes, the President of the League affirms without fear of successful contradiction that the conclusion of the whole matter is that the best interests of the city demand that an investigation, such as is asked for, must be made before Norfolk undertakes any important work of street paving, no matter when it may be done, whether now or at some future time."

As stated above, the steps urged by Lieut. Shaw are to be adopted, and the desired investigation will now take place.

The Eureka Fire Hose Company

A WIDE circle of friends and associates will learn with regret of the death of Mr. Warwick H. Payne, which occurred on August 9th, after an illness of several months.

For a number of years Mr. Payne represented the Eureka Fire Hose Company in the sale of its fire hose throughout the Southern States, having his headquarters at Atlanta, Ga., and his energetic labors contributed not a little to the popularity of the Eureka products in that territory.

We learn that Mr. Payne will be succeeded by Mr. P. O. Hebert, who hereafter will represent the company as general sales agent for the exclusive sale of its high grade brands of fire hose in the States of Georgia, Alabama, Mississippi, Louisiana, North and South Carolina, Florida, Virginia, Texas, Indian and Oklahoma Territories. Mr. Hebert will have associated with him Mr. D. E. McGaw, who will locate at Dallas, Texas., Mr. H. H. Alvis, who will locate at Charlotte, N. C., and Mr. C. B. Payne, at New Orleans, La.

Mr. Hebert will be in charge of headquarters at 615 Peters Building, Atlanta, Ga.

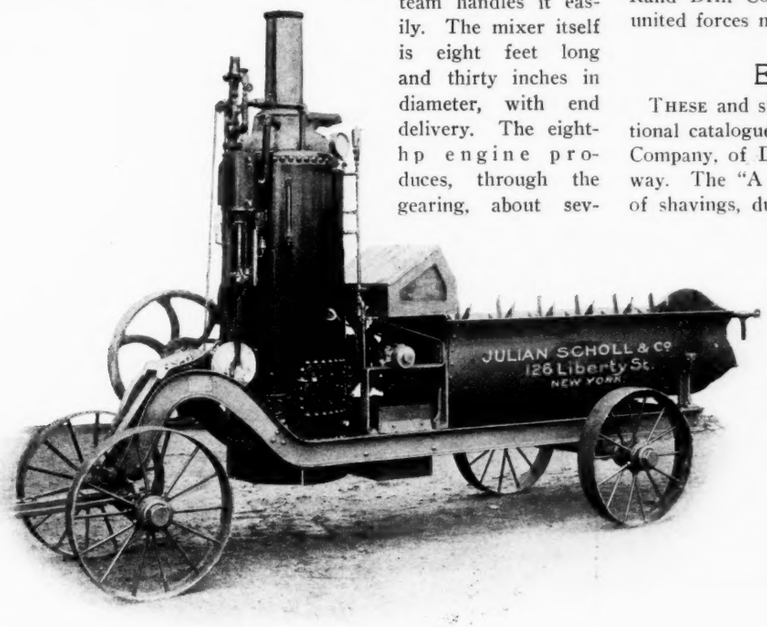
Water-Works Plant

IN connection with the new filtration plant for the city of Pittsburg, Pa., the Water-Works Equipment Co., of 180 Broadway, New York, has signed contracts with the city to furnish three 30 in. by 30 in. and two 20 in. by 20 in. connections of their patent type. The company has also secured a contract to furnish the city of Trenton, N. J., with one 30 in. by 30 in. and one 30 in. by 16 in. connection. These are among the largest contracts ever placed in this line, and call for the use of the largest tapping machine ever built for this work, equipped with a 6½hp Mianus gasoline engine.

The company is to be congratulated on its new type of sleeve, which will be used in the Pittsburg and Trenton contracts; there is a hub end on the sleeve, requiring simply yarning and leading and thus saving over $500 in lead on the two jobs, as compared with what would be required by other types of sleeve.

A Portable Concrete Mixer

THE machine illustrated below has been introduced by Julian Scholl & Co., 126 Liberty street, New York, to meet those cases which do not warrant the erection of a fixed plant. It moves easily over rough roads and can be turned in narrow streets; a two-horse team handles it easily. The mixer itself is eight feet long and thirty inches in diameter, with end delivery. The eight-hp engine produces, through the gearing, about seventy revolutions per minute, and the machine will mix about 200 cubic yards of concrete per day. In other words, it readily handles all that six or eight men at broken stone, and four to six men at sand and gravel can shovel into it.



A PORTABLE CONCRETE MIXER

The Edison Portland Cement

THE reputation for versatility already enjoyed by Mr. Thomas Edison will be enhanced by the knowledge that he has embarked upon the manufacture of high-grade Portland cement. The plant which has been erected at New Village, N. J., has been in successful operation for about two years, and a special feature has been made of fine grinding, as securing for the finished product the greatest possible efficiency. In this way, 85 per cent. of the cement is guaranteed to pass a 200-mesh screen. This result is, of course, not attained without additional expense, but it is claimed that the greater freedom from coarse and inert matter (of no more value than so much sand) justifies buyers in taking this factor into account. As the company is prepared to deliver under stringent specifications, ensuring the passage of 98 per cent. through a 100-mesh sieve, it will be seen that the guarantee is of a very comprehensive character.

The company's New York sales office is 1309 Empire Building.

Fire Equipment for Small Communities

THE Wirt & Knox Mfg. Co., of 22 N. Fourth street, Philadelphia, have just issued an illustrated catalogue dealing with their various types of fire department carts. Special attention is directed to a combination ladder cart, designed with special reference to the needs of small municipalities in which volunteer effort has to be largely depended upon.

The equipment of this piece includes firemen's ax and crowbar and two fire extinguishers; large tool box with compartment for six extinguisher charges; four polished brass lanterns, and three sections of ladder. The reel has a capacity of 500 feet of 2½-inch hose, and the cart is mounted on heavy "Archibald" wood wheels, with roller bearings.

A Change of Address

THE Ingersoll-Rand Company will take possession of its new offices on the fourteenth floor of the Bowling Green Building, 11 Broadway, New York, on August 1st. At that time the offices of the Ingersoll-Sergeant Drill Company at 26 Cortlandt street and the Rand Drill Company at 128 Broadway will be given up and the united forces moved to the new offices.

Exhaust Fans, Dry Kilns, etc.

THESE and similar appliances are dealt with in an illustrated sectional catalogue (No. 180), recently issued by the American Blower Company, of Detroit, Mich., with New York offices at 140 Broadway. The "A B C" exhaust fan is largely applied to the removal of shavings, dust, smoke and fumes, the elevating and distributing of cotton and wool, and other purposes in industrial buildings. The long experience of this company has enabled it to produce fans adapted to every requirement of use, a fact of which the present catalogue affords eloquent if silent proof. Part of it is devoted to dry kilns for lumber, the "A B C" mechanical draft, and other allied appliances.

Water Purification

THE American Steel and Wire Company, having New York offices in Battery Park Building, direct attention, in a handy pamphlet, to the results obtained from the use of copper sulphate in treating water of suspicious origin, either alone or in conjunction with iron. The latter sulphate is a by-product of the wire mill, resulting from the use of acid to take off the scale previous to the drawing process, and the company has thus become interested in experiments arising out of Dr. Moore's recent discovery in regard to the purification of water by the addition of what is ordinarily looked upon as a deadly poison. The pamphlet contains reports, by United States Government experts, of experiments conducted at Anderson, Ind., in February.

A Paving Investigation

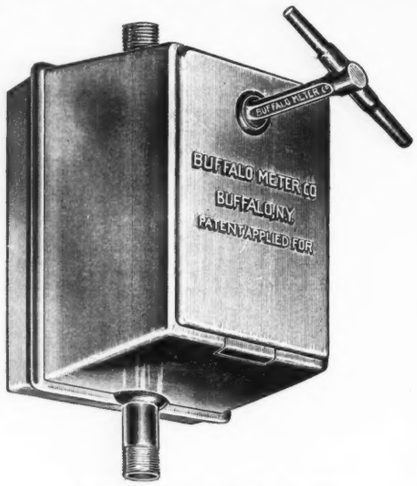
ACCORDING to a recent issue of the Paducah, Ky., "Sun," a committee of local property owners who visited St. Louis for the purpose of noting the relative merits of bitulithic and asphalt paving, are unanimous in the belief that bitulithic has more resiliency, is less slippery and noisy, and more durable than other material. This view is confirmed by interviews with individual members of the visiting committee, who appear to have been most thorough in their researches, stopping and questioning drivers and automobilists on the streets and interviewing the street department and private citizens. Lindell boulevard is described as "an excellent sample of the right kind of bitulithic."

Sewage Lifting by Air Displacement

AN illustrated pamphlet issued by Merritt & Company, 1024-1030 Ridge avenue, Philadelphia, gives a concise account of an appliance, protected by the Adams and Priestman patents, for which this firm is acting as licensee. It is a matter of common occurrence that isolated low-level areas in a sewerage system require motive power for lifting their sewage into the general system, and this is frequently a burdensome duty, owing to the necessity of placing a man, or rather two men, in charge of the plant. The automatic sewage lift now referred to carries out this function without control, in many cases using the high-level sewage as the means of lifting the smaller volume of low-level sewage; in others, by the introduction of a sufficient supply of water. Many examples of its successful application are noted in Merritt & Company's pamphlet. The same firm handles special plant for the automatic distribution of sewage in purification works.

Lock Box for Meters

Tampering with water meters can be eliminated by enclosing them in an iron box having all the bolts on the inside. The accompanying illustration shows an iron lock box with the bolts so arranged. It is made in two parts and bolts securely around the meter. To unlock, a key wrench is used which also fits the bolts, thus allowing the box to be put up or taken down with the tool used to open it.



IRON LOCK BOX FOR METERS.

The door opens on a hinge joint and the whole box is varnished black and presents a neat appearance. For fuller particulars and price, address the Buffalo Meter Co., 290-296 Terrace, Buffalo, N. Y.

Water-Works Bonds

The city of Brainerd water-works franchise expires January 1, 1907, and the city council is now considering the advisability of letting a new franchise, or of putting in its own plant. If a new plant is installed it will cost in the neighborhood of $125,000, and in order for the city to put in its own plant, it will be necessary to float the bonds at 4 per cent. Send any communications to chairman of Special Water Commission, Ald. Geo. Halladay, 416 Second avenue, E., Brainerd, Minn., who will be pleased to consider all propositions.

Lighting Franchise Expires

The lighting franchise held by a private company in the city of Ashland, Wisconsin, expires in June, 1907. This franchise is exclusive for public and private lighting and the company is now seeking a renewal of such franchise, under an agreement to make a reduction of rates.

According to the sworn annual report the company's net income on public and private lighting for the year 1904 was $13,256.04, and the population of the city according to 1905 census is 15,000.

The city authorities are desirous of inviting competition that may wish to enter this field and will be glad to enter into communication with investors or promoters who would like to submit propositions.

As the question of the city constructing and owning its own lighting plant has also entered into the discussion on this subject, manufacturers and contractors who might wish to equip such a plant are invited to correspond as well, for the attitude of the city authorities is to take such steps as will be for the best interest of the municipality and public.

Those wishing to correspond with a view of submitting proposals or information along any of these lines are requested to address their letters to Burt Williams, Mayor, Ashland, Wis.

Crown Sanitary Flooring

TRADE MARK

Lith Wall and Floor Insulation,

Fibre Felt and Rock Fibre Wool Deadening

Asbestos Building Papers, Roofing and Mineral Wool

ROBERT A. KEASBEY CO, 100 N. Moore St., New York
56, 58 EARL ST., BUFFALO

BOOKS FOR
Municipal Officials, Engineers and Contractors

See lists on pages 55, 56, 57, 58 of this Issue.

THE PROCEEDINGS
OF THE
Engineers' Club of Philadelphia
EDITED BY THE PUBLICATION COMMITTEE
PUBLISHED QUARTERLY IN
JANUARY APRIL JULY OCTOBER

A Splendid Advertising Medium

For Space and Rates, address
GEO. T. GWILLIAM, Ch'r. Adv. Committee OR WALTER LORING WEBB, Secretary
1122 Girard Street, Philadelphia

SUBSCRIPTION PRICE, $2.00 per Annum

Southern Creosoting Company, Ltd.

SLIDELL, LOUISANA.

Located in the finest Long Leaf Yellow Pine District in the United States. Capacity 22,000,000 feet B. M. per annum.